ELECTRICAL REVIEW

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ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

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The Manufacture of Electrical Conductors.

Covering.—From an electrical point of view, a conductor and its covering must in general present diametrically opposite qualities. The former cannot be too good a conductor, and the latter can never be too good an insulator, since its purpose is to prevent a passage of the current when two conductors or two parts of the same conductor come accidentally in contact. Such coverng will vary in thickness, and will be more or less resistant, according as it will or will not have to undergo the inclemencies of the weather or mechanical shocks, or according as it is to be wound once for all upon the bobbins of an apparatus under cover.

We may distinguish the wires as follows:

I. Overlaid wires, or those simply covered with a layer of silk or cotton wound around them with a bandage.

2. Braid-covered wires, in which the covering, forming a true tube of braided silk or cotton, constitutes a much firmer envelope than does the preceding, and one which is capable of resisting repeated friction. The conductors of the telephone and medical apparatus are types of this kind of conductor.

3. Cables, whose covering is always multiple and more or less complex, but which always comprises at least a primary, electrically insulating covering, and a second one whose purpose is to serve as a protection to the other.

4. In submarine cables, which form the last of the series, the protecting layer is itself covered with a third envelope, formed of iron wire, called an armor, and designed to support all the tractive stresses to which the cable is submitted. We shall omit reference to the manufacture of submarine cables, and confine ourselves to that of wound and braid-covered wires, and of simple cables that are also known as electric light cables.

Overlaid Wires.—The winding of naked conductors is effected by means of machines called whipping wheels. The number of bobbins in each machine varies with the size of the wire to be covered. Thanks to the kindness of Mme. Bonis, who has kindly shown us in detail the interesting process of manufacturing electrical conductors, we are enabled to place before our readers a representation of one of the twenty-four bobbin whipping machines of the most recent style, and furnished with all the latest improvements that long practice alone could suggest. This machine (Fig. 3) consists in reality of twenty-four distinct apparatus, which are mounted upon a single frame and actuated by one and the same gearing. One person, a woman, suffices in general to start and attend to these twenty-four bobbins. Each of the latter is capable of covering about 400 meters per day, and the product of the entire frame is therefore nearly 10,000 meters per day.

The wire to be covered is placed upon the bobbins at the upper part, descends vertically, bends at right angles to run over pulleys placed behind the frame, and then passes into the axis of other bobbins that are filled with silk and have a rapid rotary motion. The silk which these bobbins carry then winds around the wire, which is moving forward with a regular motion under the action of the pulleys around which it runs These pulleys are shown toward the centre of the frame. After leaving them the wire winds around bobbins in the upper part of the frame. By properly proportioning the speed at which the wire is carried along, and that of the bobbins' rotation, one can vary at will the thickness of the insulating layer, which is formed here of a continuous band of silk or cotton making a certain number of turns to each centimeter of wire covered. All transmissions of motion are made by the aid of small cords ; and a series of conical pulleys that correspond to each bobbin permits of regulating the speed with which the wire moves forward, this varying between 30 and 60 meters per hour.

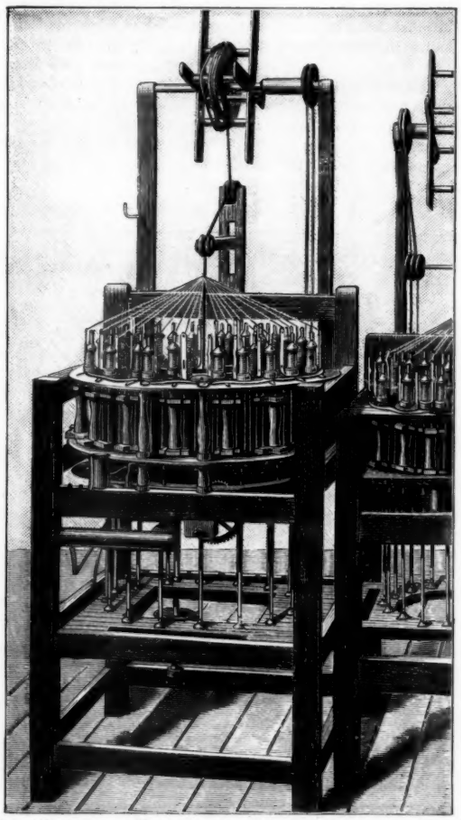


FIG. 2. THE WALTZER, A MACHINE FOR COVERING ELECTRICAL CONDUCTORS.

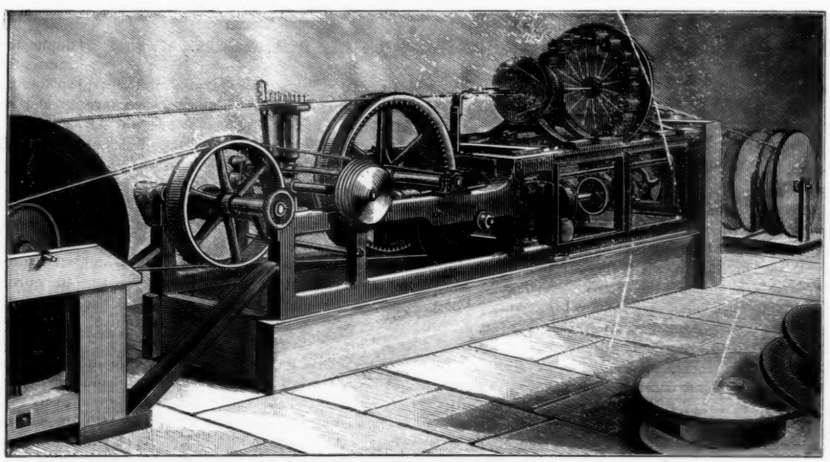


FIG. 1.—ELECTRIC CABLE MACHINE.

The bobbins upon which the wire is wound likewise present special arrangement that are very interesting. As may be conceived, the length of wire that they are capable of taking up at one revolution depends upon the quantity that they already carry, since the diameter increases as the bobbin fills. If the latter possessed a regular motion, it would wind badly at the beginning and would infallibly break the wire at the end. All this is prevented by carrying it along *by friction*. To this end the diameter of the pulleys is calculated so that the speed shall be a little greater than that that corresponds to the empty bobbin, that is to say, to the least advance per revolution. The transmitting cords, after passing over the pulley of the bobbin, support a small roller furnished with a hook from which are suspended weights for regulating their tension. These weights are shown at the bottom of Fig. 3. When the tension of the covered wire exceeds a certain amount, the cord *slips* on the pulley of the bobbin and fails to carry it along. There results from this a motion which is partly a sliding one, and an excessively regular winding of the wire, since the tension is constant and is regulated by the weight suspended from the friction roller.

It now becomes a question of distributing the wire throughout the length of the bobbin. To this end, the bobbins are mounted upon a frame which is movable horizontally. A series of gearings and a cam (represented to the right in Fig. 3) give this frame a slow and regular backward and forward motion.

The travel of the frame is equal to the internal length of the bobbin between its two flanges, and the winding of the wire is effected very uniformly. The travel is changed, according to the diameter of the wire, by modifying the train of gearings. It may be seen, in fact, that the relative speeds of the different parts of the machine depend upon the diameter of the wire and the nature of the covering, although the principle is the same for all. The 24-bobbin machine is designed especially for wires of small diameter that are always covered with silk. For wires of medium and large diameter the machine is provided with a less number of bobbins of larger size.

In Fig. 3 may be seen what appears to be cylinders of different sizes, divided off by black lines. These are composed of bobbins, each carrying a like quantity of silk. Before beginning operations, there is thus stored up in a tube which is traversed by the wire the number of bobbins full of silk that are necessary for the entire work. When one of these bobbins is empty it is taken off and replaced by a full one from the stock in reserve. When the wire is to be covered twice it is, with its single covering, passed

into a second machine, and the winding is effected in a different direction, and so as to obtain a crossing of the threads in order to give greater firmness. For medium wires we have seen in Mme. Bonis' establishment machines that performed the two opposite windings at a single operation.

BRAID-COVERED WIRES.

The machine for covering the wire with braid is termed, in the language of the workshop, a "waltzer." Fig. 2 represents one of these apparatus in the act of covering an electric light conductor. The motion of the wire is here the opposite of that which it has in the overlaying machine. The uncovered wire enters through the lower part, while the covered is stored up in the upper part. The braiding constitutes a true fabric of more or less compactness. The number of threads that compose it varies between 12 and 48. The "waltzer" shown in the cut is arranged for 48 bobbins. These latter, which are arranged vertically, are grouped in twos, and are carried along by 24 disks that revolve alternately in one direction and the other through gearings, that are arranged upon a circumference whose center is occupied by the wire.

The wire to be covered passes through the center of this circumference, and all the threads, in rejoining the point where the braiding is performed, form a sort of conical surface which is well shown in the figure. The bobbins containing the thread of each braid are mounted upon vertical spindles. Owing to a mechanical combination which is as simple as it is ingenious, these spindles change disks at every half revolution and traverse the entire surface of the 24 disks, describing in doing so a regular curve formed of small semicirc'es that are alternately external and internal to the large circumference formed by the 24 disks. Half these bobbins effect this movement from right to left and the other half in an opposite direction. The result of these combined motions generally is that each of the threads taken isolately, during one entire revolution, successively crosses all those that are running in an opposite direction while at the same time remaining parallel with all those that are running in the same direction with it, and passing alternately above and below two successively crossed threads.

The "waltzer," then, realizes automatically what is done by hand in ordinary braiding, and is identical in principle with the apparatus made use of by trimming makers in the manufacture of watch cords, etc. The mean production of one of these apparatus is 100 meters per day.

ELECTRIC LIGHT CABLES.

The English cable machine (Fig. 1) is capable, according to requirements and to the arrangement of its parts, of producing several successive or simultaneous effects, and, consequently, of furnishing a number of types of cables. There are three phases in the operation that it performs: (1) the uniting of several wires into a single strand which is afterward to be covered with India rubber or gutta-percha, according to the application to be made of it; (2) the covering of the conductor with a fabric to protect the insulating material; and (3) the covering of the whole with a band protecting material, by an operation analogous to that performed by the overlaying machine.

These two latter operations are always identical in principle, the conductor being carried along with a uniform motion, while the covering is given a rapid rotary motion around it.

When the cable is not provided with the intermediate covering, the bobbins are removed from the disk, and the conductor then receives only the external bandage. Sometimes the machine is used merely for twisting wires into a single strand, the wrappings being dispensed with.—*La Nature.*

Waterproof and Other Special Paints and Varnishes.

The *Neueste Erfindungen* says that the waterproof preparation of G. Gehring, in Landshut, is prepared by melting together 60 parts of paraffine, 15 parts of wax, and 30 parts of palmitate of alumina made by precipitating a solution of palm oil soap with alum. The stone, metal, or wood that is to be waterproofed is warmed to 140° or 200° Fah., and then coated with the melted mixture. For fabrics he employs a mixture of 60 parts of paraffine, 20 parts of palmitate of aluminum, and 10 to 15 parts of yellow wax dissolved in linseed varnish, to which is added from 6 to 15 parts of oil of turpentine.

A. Riegelmann, in Hanau, has patented a rust protector which consists of ordinary oil paint mixed with 10 per cent. of burned magnesia, baryta, or strontia, as well as mineral oil. This neutralizes the free acid of the paint, and the alkaline reaction protects the iron from rust.

To prevent iron from rusting in the ground it is painted over with a mixture of 100 parts of resin, 25 parts of gutta-percha, 50 parts of paraffine, and 20 parts of magnesia, besides mineral oil. A temporary paint for the movable parts of machinery contains 20 or 30 per cent. of magnesia or burnt dolomite, with some vaseline added to prevent drying.

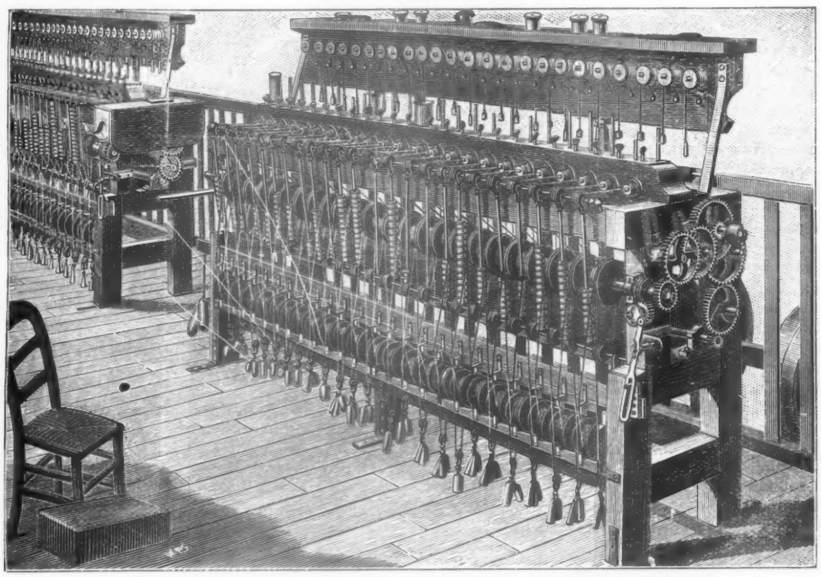


FIG. 3.—MACHINE FOR WRAPPING SILK OR COTTON AROUND THE WIRE.

Electric Light.

THE SWAN INCANDESCENT LAMP TO BE INTRODUCED IN THE CITY OF PITTSBURGH, PA.

The use of electricity as an illuminator will be greatly increased in Pittsburgh shortly, the Allegheny County Light Company having decided to extend its operations by the introduction of the Swan incandescent lamps. These lights are utilized principally for lighting buildings, and for this purpose are greatly superior to the lamps now in use. In operating them, private batteries are used that make the consumer independent to a certain extent of the central station. The battery, consisting of a number of cells containing sheet lead submerged in a solution of water and acids, is located on the premises of the consumer. Wires connect it with the dynamo at the central station, and as the electricity is ground out by the big engines it is stored in this battery. When full, an automatic cut-off stops the current. Beside the battery is a meter through which the electricity passes to the lamps, the consumer paying only for that which is used.

The incandescent system will not in any way interfere with the arc system, and it is in the fact that the two can be combined that a great part of the advantage lays. At present the machinery of the Light Company is idle during the day, starting when night comes on and the lights are wanted. When the incandescent lamps are introduced the machinery will be run in the daytime to fill the batteries and not lay idle eating its head off, as is said of a horse. To the consumer this is a great advantage. He has his supply of illumination given him in the daytime, and in the evening he can use as much as he pleases, turning it on and off as easily as with a gas burner, paying for the amount consumed and nothing for leakage. The company retains ownership of the batteries, guarantees that they will not depreciate over five per cent. a year, and that they give eight Swan lamps of sixteen candle power each for every horse-power of energy put into the battery. A No. 8 dynamo will supply forty Brush arc lights of 2,000 candle power each at night and during the day charge thirty-five storage batteries with electricity to supply 1,400 Swan incandescent lamps for burning four and a half hours. The company will increase its plant by adding an engine of 120 horse-power, and expects to have the first of the incandescent lamps burning in the course of ten days or two weeks.

Cutting and Setting Precious Stones.

BY A. WAGNER.

Crystalline gems, like diamond and topaz, are generally cut in such a manner as to have flat, smooth faces. Precious stones that decompose the light and thus produce a play of colors, are polished in such a manner as to heighten this effect as much as possible, which is accomplished by making a large number of small facets. The brilliant is an example.

Precious stones that do not crystallize, and are distinguished by play of colors, like the opal, or peculiar effects of light, like the cat's eyes, are usually polished round or oval, like a loaf of bread or a half of an egg.

Gems are set in two different ways, distinguished as a free setting (*ajour*) and band setting (*en cassette*). In the former the stone is exposed on all sides and only held by little clasps. All its properties, its fire, its play of colors, show to the best advantage here. Hence very valuable gems are never set in any other way. Flat stones that are set in rings are sometimes fastened on the edge so as to leave only the top and bottom surfaces exposed.

In the band setting the stone forms the lid of a gold box, and if the gem is transparent, the upper surface is generally made flat and smooth, while the under side forms a low pyramid.

In those stones which receive a band or box setting, and are less valuable, the beauty of the stone is increased by lining the box with colored tin foil, the color of the foil corresponding to that of the stone. Thus, for example, a piece of dark yellow foil is placed under very pale topaz, a deep purple foil under a pale amethyst, and so on, so that the light reflected from beneath through the stone will have a deep yellow or violet color, giving the stone a much finer appearance than if it were set free.

When setting common stones in cheap goods, they do not take the trouble to line the box with tin foil, but merely give it a coat of some colored varnish. This method is not one to be recommended, for a stone that has the foil beneath it looks much handsomer.

In order to make a cheap article with genuine stones, the following ingenious device is resorted to: Thin slips of some gem, as emerald, for example, are backed up with a glass of exactly the same color, and the glass likewise polished. By setting one of these double stones with the real stone outward, and the glass beneath, the surface will, of course, exhibit all the properties of the gem, such as hardness, &c. These half-genuine stones are known as "underlaid gems," or in French as "*pierres fines doublée.*" When these underlaid gems are skillfully set, it is difficult even for the expert to distinguish them from perfectly genuine stones. But still it is easy to distinguish them by holding the stone before the eye in such a manner that the light reflected from the top enters the eye at an oblique angle; the surface where the stone and glass meet can be distinctly recognized by the difference in the refractive power of the two media, having the appearance of a crack or flaw in the stone. The public are frequently deceived by dealers, who represent these underlaid stones as being perfectly genuine.

House-Lighting by Electricity

To make an installation pay it ought to be on a very considerable scale. A steam engine and a dynamo may be quite sufficient to supply all the lamps that are required throughout the establishment. But what if engine or dynamo breaks down? No one would like to run the risk of being left at any moment in total darkness by such a contingency. He would prefer in prudence to duplicate his generating machines, and, of course, the first cost and maintenance of such an increased installation would be relatively greater in a small establishment than in a large one. Again, in a large establishment there are an infinite number of uses to which electricity can be put; chaff-cutters, pumping engines, saw mills, sewing machines, and luggage lists could be worked by it, and a single steam engine could keep several dynamos in useful employment, and so lessen still further the chance of mishap. The electric current is so sensitive that when a badly-laced band from the driving wheel of a steam engine works a dynamo, the lights in the circuit are observed to give a sudden shiver every time that the laced ends of the band pass over the drum. It may, therefore, be easily supposed that the least failure in steadiness on the part of the driving engine would produce a flicker in the lights, and a stoppage even for a single second, such as might be produced by the slipping of a driving band, would result in total darkness. Governors of very sensitive construction are devised for steam engines used for electric lighting work, and the flicker of light in some of the best of them is reduced to a minimum; gas engines, too, work in many cases very smoothly. Water power, when it can be obtained, is the steadiest as well as the most economical of all. But even with the best of engines the intervention of a storage battery, the flow of which would be independent of any jerk in the motive power, would always be advisable.

The Brush Electric Light Enterprise at Rochester, N. Y.

We illustrate herewith the Brush electric light plant on the banks of the Genesee River at Rochester, N. Y., which we were unable for want of space to do last week. See page 4, edition of August 16, for full description of this remarkable hydraulic enterprise.

Electric Railways.

We have recently referred to the excellent progress being made by the two electric railway companies lately organized. We find in the columns of our exchange, the *Manufacturers' Gazette* of Boston, the following comments on the same subject under title of "from the tea-kettle to the dynamo."

For ages the methods of travel, as we all know, were crude indeed, and not until 1593 is there any record that the true nature of steam was known, although the force itself must have been discovered at a much earlier date.

A rude kind of steam engine existed before the days of James Watt, but Watt was the first to apply his knowledge in an intelligent way, and from his study of the steam escaping from the tea-kettle in his mother's kitchen the railroad became possible, though George Stephenson's "Rocket" was the first utilization of steam in a locomotive.

Great as has been the progress of affairs since the latter's day, and important as have been the improvements in railroading, notably so in the last fifteen years, the science of transportation is yet in its infancy.

The existence of the telegraph, the telephone, the electric light and various other electrical devices, emphasizes the fact that the uses to which "educated lightning" may be put are almost numberless.

The attention of the scientific world was first drawn to the possibility of utilizing motive power as a means of generating a current of electricity, by Prof. Faraday's discovery of electric induction in 1831, the result of that discovery being the manufacture and use of the dynamo-electric machine, which, definitely speaking, is a machine for translating motion into electricity. In the dynamo, the magnetic field in which the armature rotates is formed by electro-magnets, having their coils connected in a circuit with the coils of the armature, and the main line, whereby, upon starting the machine with a minimum of magnetism in the cores of the field magnets, an inter-reacting cumulative action takes place, the initial magnetism creating an initial current in the armature, which, flowing around the field magnets, increases their force, in turn reacting on the armature coils until the maximum current is produced.

After Faraday's discovery it was proved that although the individual current produced by magnet induction was exceedingly small and momentary in action, it was capable of unlimited multiplication by simple mechanical arrangements, and by these multiplications the principal effects of the present time dynamo machines were slowly developed.

Apropos of electricity as a motor, an eminent authority, Prof. Sylvanus P. Thompson, declares that there is a far greater future for the transmission of power through the agency of electrical energy than for the translation of electricity into light. Be this as it may, the air is charged with "mentality;" invention is rife, improvement is the law, and he who is abreast of the times, and will "do himself the honor to think," must admit that electricity is likely to prove a powerful competitor to steam as a motive force. Bicycles and tricycles are now driven by electricity, and the application of the same power to other carriages, street cars and railway trains now steam propelled, is inevitable, and has already been made.

Mr. Edison, Mr. Stephen D. Field and Prof. Siemens have all claimed priority in the invention of electric motors for railways, but the priority of the inventions of the first two is allowed to be incontestable. The credit of inaugurating the first real electric railway in Europe rightly belongs to Siemens, but the practical development has been materially advanced by both Messrs. Edison and Field, who have built short lines, one at Menlo Park, New Jersey, and the other at Stockbridge, Mass. The one at Menlo Park was begun before the Siemens road at Berlin, Germany, although the latter was completed first. Shortly after the Menlo Park road was built, it was reconstructed and increased in length to one-half a mile, and two years ago the present line, two and a half miles long, was built. Aside from the rail system, or the conveyance of the currents by the rails, and also by a third rail, various ways have been tried by other electricians, among them being the French method of carrying the currents by overhead conductors on poles. This latter way is awkward, undesirable and impracticable. while the two or three-rail system is undoubtedly the best and most practical

A description of the Menlo Park road may be interesting to our readers.

It is like any ordinary railroad, with curves and grades, one of these latter being 33 feet to the mile, and encountering the usual rocks, streams and ravines, is built across the country back of Menlo Park, the plateau in the rear of the laboratory sloping down to a woody level, through a section of great and varied beauty, and is well graded.

The system includes not only the locomotive, but switches, turn-tables and the ordinary railroad appliances operated wholly by electricity.

The track is 3½ feet gauge, the rails being of light-weight iron, 16 lbs. to the yard, the common rail weighing 64 lbs. and 1" wide at the top or "tread;" the rails to be used in any given instance, however, can be graduated to the heaviest of the traffic. The heavier the iron, of course, the greater the conductivity.

The generating power, a fine Brown engine and four Z dynamos, is located 1,000 feet from the end of the line, and the currents are conveyed to the track by cables, one connecting with each rail. From the junction of the cables with the track the current is carried by the rails to the motor, the wheels of which being metal, pick it up, it passing through them to metal brushes, on to the conductors leading to the driver's house, and from there is led again by conductors to other brushes, connecting with the armature of the dynamo-electro motor in the forward part of the locomotive. This gives the forward motion, and reversing the direction of the current flowing through the revolving armature, causes it to revolve in the opposite direction, thus producing backward motion.

The rolling stock of the road embraces two passenger coaches, seating respectively 16 and 36 persons, and ten freight cars of 6 tons capacity each.

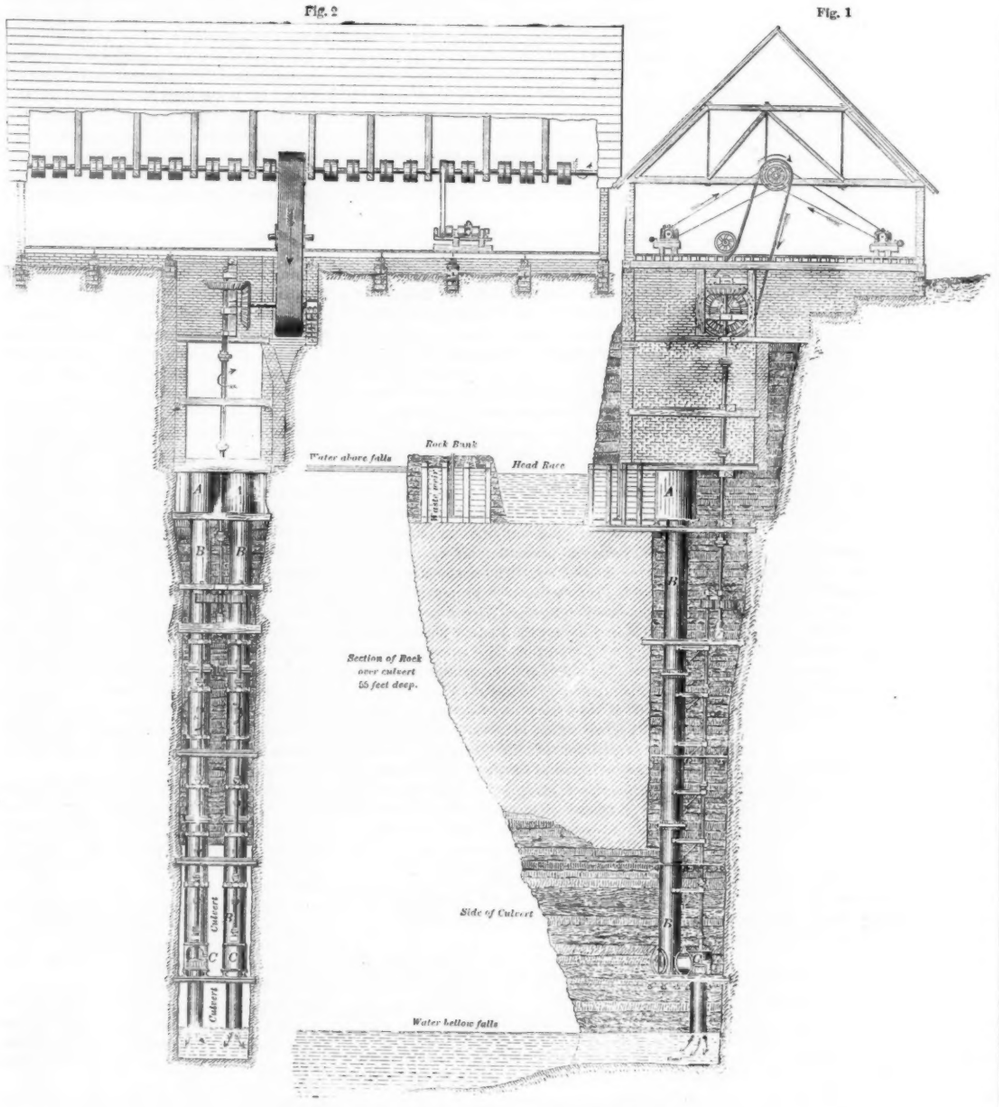
The motor has the field magnets set laterally instead of perpendicularly; contains regulator, brake, clutches and all necessary appliances; weighs about 4 tons; has a short cab for the engineer; is perhaps a third as long as a steam locomotive; propels 60 tons net eight miles an hour, actual running time, about one-half the average freight-train speed, with perfect ease, while almost any desired speed can be attained, the rate depending simply upon the horse-power of the dynamo and engines used, the average rate being 30 miles an hour for the passenger train.

Having "detailed" the several features of the road we will take a trip over it. Adjusting the regulator and letting on the current we glide smoothly out of the motor-house, swing off the switch on to the main track, wind around curves, dash over brooks and bridges, shoot through woods, spin by meadows and whiz past farm houses, speeding along at an easy 30 miles an hour, with no dust, smoke or hissing steam to mar the pleasure of a run through the fine belt of country which the road threads.

Alighting at the end of the route a brief halt is made, and the turn-table inspected, when the return trip is begun.

We travel for some distance up a grade of 33 feet to the mile at the same rate of speed as on the dead level, 30 miles an hour, with no extra effort, and on nearing the home end of the line, where the current makes in from the generating station, no faster time is made than up the heavy grade, 2 miles distant. An even current of a safe, low degree of intensity is maintained throughout, and the ease and facility with which the entire system works and is controlled is very marked.

When running at the highest speed the locomotive is brought to an immediate standstill, and as instantly started, with no appreciable friction, by the simple closing of the regulator and adjustment of the lever. The motive force may be reversed either by backing the train down again to the point from which the start was made, by



BRUSH ELECTRIC LIGHT PLANT AT ROCHESTER, N. Y.

means of the reversing gear, or by turning it completely around by means of a turntable. The mechanism of the locomotive is very simple, the absence of reciprocating parts and the presence of but few moving ones doing away with those irregular, swaying motions, sudden strains and continual shocks to which the steam locomotive is subjected because of its complicated construction. The motion in the electric motor being wholly rotary and all in one direction, there is not that racking of the tracks common to the steam device.

Owing to these facts and the no less important one that the resistance of the rails is so well overcome, the wear and tear of the electric locomotive is practically nothing. The chief disadvantages of the ordinary railway are so obvious as to suggest themselves to every one, but for the sake of comparison with the merits of the electrical system we append them:

The weight of the locomotive and tender is a dead loss, since they carry no useful load and are moved at great expense. This weight, in fact, often amounts to fifty per cent. of that of the remainder of the train. Being concentrated upon a few points it necessitates, heavier, stronger and much more costly bridges and tracks, while involving great labor and expense in maintenance. It produces large volumes of smoke and cinders, which, together with the noise of escaping steam, are alike disagreeable and annoying to passengers and to the public. Danger to life and property from the explosion of boilers and from fire. The small percentage of useful effect of the coal consumed, compared with that which might be obtained under a stationary boiler, owing to the large surface exposed to radiation, and the invariably unfavorable condition of consumption, among which may be indicated the fact that this coal is often not completely consumed.

On the other hand, the following advantages are incident to electrical propulsion: Every pair of wheels can be utilized, either for motive power or to stop the train. By suitably adapting the speed of the generator to that of the electro-motors, fully as much as seventy per cent. of the useful effect of the generators can be converted into motion. Careful experiments have demonstrated that with an electro-motor as high a rate of efficiency as one-horse power may be obtained per fifty pounds dead weight of motor. By properly arranging the connections, a train running into a section already occupied by another train, will be brought to an immediate standstill, and will remain at rest until the preceding train has passed out of that section, thus obviating all possibility of collision and necessity for danger signals. When the current is conducted by the rails, a broken rail, when metallic contact was sundered, could not be approached until repaired, and an open drawbridge would break the electric contact, and so many of the most frightful accidents that have been a reproach to railroad management would be rendered impossible.

In relation to the question of speed obtainable on an electrical railway: It is limited only by the cohesion of the metal of the wheels, the latter flying apart when extreme velocity is reached; but as even the most rapidly inclined person would be satisfied with an average of 125 miles in hour, the fastest time is no objection to the system itself. Doubtless most persons would be satisfied with one hundred miles an hour as the maximum, which is vastly greater than any steam locomotive ever made, and faster than it is proposed to run. The Pennsylvania is probably the finest built, ballasted and equipped road in this country, at least, and makes some very fast time, but there are only two trains running between Jersey City and Philadelphia, ninety miles apart, which accomplish the trip in two hours, making as they do but one stop. As to economy, electricity is cheaper than steam, it requiring for the production of one-horse power of the locomotive engine eight to fourteen pounds of coal, or say an average of ten pounds, while for one-horse power of electricity generated by a stationary engine but five pounds of coal are used, and a cheaper quality at that, so that the gain per horse-power over steam is at least fifty per cent.

Considering train service, the electric system is reduced to such scientific nicety, as proved by actual experience, that but one man, of ordinary intelligence, is needed for running the locomotive and he easily manages the entire train.

That force or system of forces that will best serve society and affairs, is in the end the winning one and the electric railway will sooner or later displace the steam road.

Whether on elevated, surface, or underground railroads, in mines or tunnels, where noxious gases poison the air, and where it is an absolute necessity that no further vitiation shall take place, on mountain or plain, wherever, in short, exists a need for the electric locomotive, the device will meet and fill it. In this connection the company that was recently formed in New York for the purpose of controlling, pushing and developing all the devices and patents for electric motors of Messrs. Edison and Field, in this country, known as the Electric Railway Company of the United States, embracing well-known railroad and transportation men, as well as prominent electricians and electric light people, is a very strong one and has ample capital. Stephen D. Field is the electrician, and Thomas A. Edison consulting electrician. The system secured to this company embraces all the paraphernalia essential to electric rail locomotion and covers the running in blocks or as a continuous electric line with any number of trains upon a given section, and automatic control of the trains, so that should two approach within a regulated distance they can be made to stop or even retreat from each other. The dynamos are to be run by steam at either end of the road, the trains to run independent of each other. Then, too, the train and station are all to be lighted and possibly heated by electricity, the current being taken up from the conductors.

Although the introduction of these motors upon the long lines of railroads may be delayed by the necessity for the gradual displacement of the plant, their ultimate adoption is absolutely certain, and that in the very near future. To show that this is well understood and appreciated by one of the railroad magnates of this country, it is only necessary to say that a controlling contract was entered into months ago by an executive officer of one of the great lines, the completion of which will mark not only an era in the development of this country, but stand as a monument to the far-reaching foresight of one of its strongest and ablest railroad men.

Upon an Universal Dead-Beat Galvanometer for the Rapid Measurement of Strong Currents or High Tension.

NOTE BY M. DUCRETET—PRESENTED BY M. C. WOLF.*

The tangent galvanometer under consideration possesses the advantage of giving almost instantaneous indication of the strength of currents. This valuable property is obtained by the suppression of the oscillation of the needle which is completely immersed in a transparent liquid contained in a compensation box like those already used for marine compasses. This arrangement, which may be adapted to any kind of galvanometer, stops the oscillation much more quickly than the copper buffers or powerful magnets some times employed, and it leaves the needle all its sensitiveness.

It follows from this:

First. That in the study of batteries we may obtain the value of the intensity current strength or of the electromotive force before the phenomena of polarization are produced, although they are produced very rapidly when the battery is closed by a circuit of no resistance, as in the case for the measurement of current strength.

Second. That we may follow, step by step, all the variations of the current, weak or strong, slow or rapid, an observation which is valuable for the study of the currents from batteries, and especially for those from magneto-electric machines.

The magnetized needle of very small dimensions is supported by an agate cap upon a very fine non-oxidizable point; it is lengthened by a very thin stem of aluminium which points to the divisions of the dial. The bottom of the box is formed of a platinized mirror, the index of the needle is reflected there and the superposition of the index to its image prevents any error of parallax.

The box containing the needle is mounted at the center, at the end of a graduated scale, movable itself upon a vertical axis. A powerful magnet, acting as a directing magnet, may be fixed below the needle; its action is added to the directing action of the earth, and constitutes a tolerably intense magnetic field, which renders the external variations scarcely perceptible. The circular multiplying frame is movable along the rule, and may be brought rapidly to any distance from the needle by means of a rack and button.

Owing to this arrangement the galvanometer may be employed for the measurement either of the strength of currents or the electromotive force of batteries within extensive limits, from $\frac{1}{10}$th of an ampere to about 400 amperes and from $\frac{1}{10}$th of a volt to 700 volts and upwards for electromotive force.

In the first case (amperemeter) we make the current pass through the frame of the multiplier itself, the resistance of which is inappreciable. We determine, by experiment, a table of values corresponding to the degrees of the dial, according to the various positions of the frame upon the scale and the value in amperes of the current which traverses it.

Experiment shows that there is direct proportionality up to 35° between strengths and deviations

When it is employed as an electromotive force galvanometer or voltmeter, we pass the current through a very fine wire, coiled round the frame and presenting a very great resistance—5,490 ohms. The strength of the current is then very nearly proportional to the electromotive force. We calibrate the apparatus in volts for the various positions of the frame. Proportionately between the electromotive forces and the degrees of diviation is maintained up to about 35°.

It is necessary to frequently test the apparatus, which may vary in consequence of variations of the horizontal terrestrial conditions and of the directing magnet This verification is made by putting in circuit a large Daniell element, of which the electromotive force is known and of which we determine the resistance.

* *Comptes Rendus.*

On the Application of Electricity to the Working of Coal Mines.

A PAPER READ AT THE LATE LIEGE MEETING OF THE INSTITUTION MECHANICAL ENGINEERS

The London *Electrician* publishes the following very interesting communication from Mr. Allan C. Bagot upon the above subject.

The writer proposes to divide this subject into two heads as follows:

1. The application of electricity to signalling purposes.

2. The more recent application of powerful electric currents for the purpose of illumination or of transmission or storage of power, both on the surface and within the workings of the mine itself.

1. ELECTRIC SIGNALLING IN MINES.

The increased depth of the shafts of collieries in this country and the introduction of rapid winding gear, have rendered the method of mechanical signalling known as the "hammer and plate" system quite obsolete By this system the only signals that could be exchanged between the cager or man at the bottom of the shaft employed in loading tubs on the cage, and the banksman, or man in charge of the surface and engine room, were produced by pulling a wire attached to a hammer, which knocked its signals on a piece of boiler iron. This caused great loss of time and unnecessary labor, as well as some danger, on account of the lapse of time between each signal.

Again, the wire frequently broke, causing risk to those employed in getting the broken part out of the shaft, and very serious delay when the pit was drawing coal The result of such a break is to fill the road going "out by," or to the pit bottom, with loaded tubs that cannot be drawn up till the signals are repaired. Consequently no empty tubs are available to be taken in to the working faces where the men are getting coal.

The loss of time thus caused is very much greater than would be supposed at first sight.

The writer's experience further shows that in cases of accident traced to defective signalling, contradictory explanations were generally offered by those in charge of the signalling appliances.

Again, in the case of inclined planes underground, driven by an engine on the surface, unless the latter can be signalled to stop instantly from any part of the road, fatal accidents will be of such frequent occurrence as to render any extensive scheme for such haulage a matter of grave responsibility to the manager, and of great and unnecessary risk to the men.

A further source of danger was present in foggy weather, where the engine-driver had nothing to guide him but the shaft distance indicator, required by mines regulation act; nor could he at any time tell the position of the "kips" or bolts upon which the cages rest when at the top of the shaft, or know when they were pulled back to allow him to lower the cage down the pit.

In 1874 the writer determined on using electricity for signalling purposes; and from thence to 1877 he carried on a series of experiments in different shafts with a view to determine whether insulated cables, naked copper wire, stranded copper or iron wire, or galvanized iron telegraph wire, was the most suitable conductor for conveying the current in the shafts.

The result of trials in several different districts showed that insulated cables were too expensive in the first instance, and also were practically useless, being stripped and destroyed by falling coal from the cages, &c., and especially liable to electrical leakage. What was still worse, they were subject to a form of back charge, due no doubt to the coating of coal dust which adhered to the sheath of the cable.

Further, their position did not allow of their being readily tested or inspected; and unnecessary delay took place in finding disconnections and other electrical faults, when the cable was not manifestly disturbed or injured. Stranded iron wire was found too prone to rust, and of too high an electrical resistance; stranded copper wire too heavy; solid copper wire too soft, and apt to draw out. No 11 galvanized-iron telegraph wire (0.120 in.) was too light, and of too high a resistance for either shafts or engine planes. Finally, No. 4 (0.238 in.) galvanized-iron telegraph wire was found most suited for shaft conductors, and No. 8 (0.165 in.) for engine planes.

The shaft conductors were hung vertically from shackles on the pit-frame to the bottom of the shaft, without any intermediate support, the depth in some cases being 600 to 700 yards. The conductors were provided with wooden blocks on each side of the wire, screwed tightly together with thumb-screws, to act as safety clips, and to prevent the wire from falling down the shaft in the event of an overwind or explosion carrying away the shackles on the pit-frame. To the lower end of each wire, which hung free in the sump, was attached a 20 lb. weight to act as a compensator. Harris's Deep Navigation Colliery at Quaker's Yard was thus fitted in 1880, the depth of the south pit to the 4 ft. Aberdare seam being 695 yards.

The arrangement of No. 8 wire for the engine-plane signals at Risca, North Dunraven, and other collieries, was practically the same as an ordinary overhead-telegraph line, the special shackle found most suitable being a brown stoneware insulator. For a single road the insulators are spiked at suitable dis-

tances into the props on one side of the road, and for a double road into the overhead collars or cross-timbers. The line wire passes over the groove of the insulator, and is prevented from running back in the event of a break by a binding wire passing round the insulator. The binding wire used for this purpose is No. 16 charcoal-iron wire (0.065 in.), which is bound and soldered securely round the line wire.

The insulated copper connecting wires, such as battery and instrument wires, were made of No. 16 B. W. G. copper wire (0.065 in.), which was insulated with a covering of gutta-percha, making it equal to No. 7 B. W. G. (0.180 in.), then wound with tape, and tarred with Stockholm tar.

The batteries found most suitable were twelve-cell, large-size Leclanché batteries; the outsides and the insides of the glass cells down to the level of the exciting fluid were well brushed with paraffine oil to prevent efflorescence and evaporation. The evil effect of coal dust in the pit batteries was avoided by pouring a little common engine oil on the surface of the exciting fluid, thus sealing it from the air of the mine. Great advantage was derived in wet shafts, where the electric leakage was great, by duplicating the pit batteries for quantity, and thus keeping the tension low. It is frequently assumed that the greater the battery power the stronger the signals. This is not the case where insulation is defective; the remedy lies in coupling up more cells for quantity and keeping the tension low.

The system employed at Cannock and Rugeley Collieries consisted of a single-stroke bell circuit, ringing from pit to bank and engine simultaneously, and from bank to pit only, on nine inch electric gongs of special construction; also a twelve-order dial circuit from pit to bank and engine, and again from bank through the engine dial to the pit dial. When winding coal, the banksman, using the bell circuit only, rang twice to the cager as soon as he had taken off the full tub and put an empty one on the cage. The cager, having received the signal that the banksman had completed his operations, and having also himself taken off the empty tub and put on a full one at the pit bottom, signalled twice to bank and engine simultaneously, thus warning the banksman that he had signalled the engine-driver to start. In practice this has been found far safer and quicker than the prevailing custom of the banksman starting the engine-driver. For the purpose of signalling the driver to stop, the banksman was provided with a local bell circuit from bank to engine only; but in all cases, except when the sinkers were in the pit, the starting signal was taken from the cager only.

The electrical transmission of special orders is effected by the two dial circuits previously mentioned, the current being supplied from the batteries required for the bell service. The transmitters are simply circuit closers, provided with mechanical means for ensuring an electrical contact of given duration; and by means of an air piston provision is made that the apparatus cannot be left in such a position that the circuit remains closed. The order transmitted to the receiver is also shown on the dial of the transmitter's instrument, and he only can alter it. The receiver is unable to alter either his own dial or that of the sender. This secures an absolute block system. The receiving instruments are provided with a peculiar check escapement to impel the ratchet wheel on the passage of the current; and the balanced action of the armature of the receiving electro-magnet locks the indicating needle in the proper position. The same arrangement is applied to the indicating dial of the transmitting instrument. In practice twelve separate orders may be transmitted in ten seconds.

Latterly, however, in the present year, with a view to leaving the banksman and cager at liberty, it has been found desirable to substitute clockwork transmitters in place of the step-by-step transmitters. In these new instruments the natural operation would be for the clockwork to run itself down. This is prevented by a revolving projecting pin coming in contact with the pin of a lever corresponding to the zero point on the signal, and denoting "safety." On pushing back this No. 0 lever, and pulling out No. 5 lever, the clockwork revolves, makes five separate contacts, transmits five electric currents of given duration, and actuates the receiving apparatus five times; the corresponding order, namely, "men coming up," being simultaneously indicated on all the dials in the circuit. The revolving projecting pin of No. 5 lever then arrests the clockwork until the transmission of the next signal, before which No. 5 lever must be pushed back. The receiving dial in the engine room thus informs the engine driver of what is passing; and if No. 1 cage is drawing men up and No. 2 cage is sending timber or loaded trucks down, contrary to the provisions of the Mines Regulation Act, he will not start his engines. The repetition by the receiver of the sender's order of "men coming up" (or going down, as the case may be) constitutes an absolute block, and informs the engine driver of what he is winding in the up cage; it also prevents mistakes between the banksman and cager, through which many fatal accidents have occurred previous to the introduction of this system. A diagram showed the arrangement of lines and instruments for shaft signals, as in operation at the Risca, Harris's Navigation, and Cannock and Rugeley Collieries.

Provision is further made, if necessary, for electrically interlocking the kips with a semaphore in the engine room; so that when the kips are withdrawn by the banksman, to allow of the free passage of the cage, the arm of the semaphore is moved from "on" to "off" by the action of an electric current automatically transmitted from the banksman's battery at the moment of pulling over the lever. This semaphore thus indicates automatically to the driver in foggy weather the operations of the banksman.

In engine-plane signals, the bell signals are made at any part of the road, by simply making connection between the line and the return wire, and thus closing the circuit; this can be done by the boy in charge of the journey while the tubs are running. Narrow or dangerous inclines where power is used to work the trains are a fruitful source of accident. Men using the inclines as travelling roads, and thus meeting the tubs coming out, are crushed against the sides of the road. Under certain circumstances the writer has found it advantageous to protect the roads by means of electrical train-indicators. The indicating instruments used at each end of the block section of the road thus protected are constructed as follows:—An electro-magnet *M*, is provided with an armature *K*, balanced on a pivot, at the end of which is a semaphore arm. The armature and the signal being about equally balanced, when a current flows through the electro-magnet *M* the armature *K* is attracted, and the semaphore arm flies up to "danger.' To show "line clear," or safety, when required, the operator presses down the lever *E*, which mechanically throws the signal to a position of safety. The keys used for transmitting the current are what are technically called "Morse keys," and are fitted underneath the semaphore signals.

When in use in coal mines the apparatus is thus fitted up:—Supposing *A* and *B* represent the two ends of the incline or plane, it will be seen that a man can enter the section at *B*, the semaphore indicating "line clear;" but when in charge of trucks or tubs he should in doing so throw the signal at *A* to "danger," and then no one should start from *A* to *B*. Where compressed-air locomotives are in use this system is almost essential to the safety of the men if the road is used as a traveling road. Some of the worst accidents the writer has had experience of have originated in using engine planes as travelling roads without proper means of ascertaining whether it is safe to enter; and he submits that no power should be used for haulage underground unless electric signals are used and the planes properly protected.

An application of electricity in coal mines is the electric recording anemometer introduced by the writer. The hemispherical rotating cups are placed in the main return air-way, and the recording apparatus in the fan engine room at the surface. This apparatus consists of suitable clockwork to pay out a given length of paper tape in a given time. Every five minutes the clock closes a local electric circuit within the apparatus, and thus the time is punched on the tape. The revolving cups in the return air-way are geared into a revolving wheel, so insulated that it makes contact once in so many revolutions. This apparatus and the recorder are connected together with No. 11 galvanized iron telegraph-wire (0.120 in.). According to the variations in speed of the air in the mine, the number of these closings of the circuit will vary; and, by means of a similar punching apparatus to that of the local circuit, each contact is registered on the tape by a dash similar to that of a Morse printing instrument. The number of dashes in each five minutes' interval shows the mean speed of the air, together with its variations, the tape forming thus an automatic and continuous record of the speed of the main air-current, taken at any desired part of the mine.

There is another application of electricity which has been found extremely useful by the writer. It is desirable at times to hear the action of pump-valves in the pit, without having to send the sinkers down. For this purpose the writer has used with success a modified telephone, attaching it to the outside of the valve cover; but to get really exact repetitions of the beat of the valves, a stout piece of asbestos card should be interposed between the valve cover and the mouth of the telephone. A little practice enables the engine-man to follow the action of the valves as accurately as when, in the human body, the heart's action is examined by means of the stethoscope.

2. APPLICATION OF ELECTRICITY IN MINING FOR ILLUMINATION AND FOR TRANSMISSION OR STORAGE OF POWER.

In 1881 the writer experimented at length on the illumination of the pit-bank and screens at Harris's Navigation Collieries. A Gramme dynamo machine was driven off an engine that worked a Schiele fan, thus ensuring great steadiness of motion and economy in motive power. The result of the experiment showed that incandescent lamps were useless, and powerful arc lamps, fixed 40 feet above the ground, the most suited for the purpose. On account of the absence of color in the light, the coal trimmers could pick off "brass" and "pyrites" quicker by the arc lamps than by incandescent lights. In every way the experiments proved conclusively that electric illumination of the surface was desirable at a mine of any great magnitude, and that the ordinary engineering staff of a colliery was capable of maintaining the appliances in operation after a week's instruction; but it was generally agreed that the introduction of alternating high-tension current machines was very unadvisable, on account of the likelihood of accident to the men. It was observed by the writer that no amount of warning to the colliers would induce them to leave the line wires alone. Of all types of dynamo machines, the Edison low-tension machine is most suited, in the writer's opinion, for colliery purpose; while the Brockie, Serrin, or Crompton arc lamps are suitable, if an arc is required for illumination, in connection with a Gramme or Siemens dynamo.

At the Risca collieries the electric light is introduced into the pit from a dynamo machine driven at the surface. The cable is taken down the shaft, and connected with a series of Crompton incandescent lamps of large size at the bottom. These give an excellent light, and facilitate very greatly the work of the cages and the men in the gate-roads.

But as regards the introduction of such lights into coal mines for the purpose of illuminating the working stalls and faces, the writer wishes to draw attention to the seventh general rule, section 76, mines regulation act, 1872, which provides that "In every working approaching any place where there is likely to be an accumulation of explosive gas, no light or lamp other than a locked safety lamp shall be allowed or used."

It must be borne in mind that with safety lamps a constant watch is kept on the appearance of gas.

Now, a blower of gas has been known by the writer to back up against an air current of 65,000 cubic feet per minute passing down the split; and with electric lamps no notice would be given of the fact. Such accidents—or again, a fall of roof, breaking a wire or the breakage of a lamp—cannot be guarded against; and hence the writer is of opinion that no increased safety would be afforded by the electric illumination of the working faces from dynamo machines. The danger of breaking line-wires may indeed be avoided by the use of accumulators or secondary batteries, charged at the surface from a dynamo machine.

But it is stated that thirty Faure accumulators, weighing in all about two tons, were required to illuminate by means of incandescent lamps, the Pullman express on the London, Brighton and South Coast Railway between Brighton and London. Hence the applicability of such batteries in their present state to coal mines seems very doubtful.

It must be borne in mind that a miner, when holing, requires his safety lamp just above or below his work, and is constantly shifting its position and his own as the holing progresses, to set sprags. This would be a serious difficulty; and further, before withdrawing his sprags to allow the coal to come down, he would have to move the incandescent lamp away altogether and refix it afterward. Allowing 10 minutes for the two operations, this in a mine of sixty working stalls would entail a loss of 10 hours per day—say one man's labor or 3s. 6d. Except in long-wall work, reflected illumination by means of electricity would be impracticable.

In effect, therefore, without going into details of cost at the present time, electricity can only be successfully applied to the illumination of the working faces by means of a hermetically sealed glass incandescent lamp, containing a supply of electricity for 9 hours' consumption. If this is charged from dynamo machines at the surface, due regard must be had to the length of time occupied in the operation. The weight of each electric lamp should not exceed that of the present lamps in use or 3 lbs. as a maximum. Such an appliance does not at present exist.

The useful application of electricity for the transmission of power would be confined to underground haulage, on the electrical tramway principle of Sir William Siemens and others.

But according to the writer's information such engines as those constructed at the Grange Iron Works, Durham, or compressed-air locomotives, are capabable of being used far more economically than electricity; so that the question of electric haulage need not be considered.

In support of this statement the writer may state that compressed-air locomotives have been recently introduced into the Cannock and Rugeley collieries, with a result that may be regarded as eminently satisfactory. The load taken at each journey is 10 tons, the gradient being 1½" per yard or 1 in 24. The distance run is 200 yards, the total daily work 300 tons, and the speed 8 miles per hour. The cost for haulage is ¾d. per ton. The air is first compressed to a pressure of 75 pounds per square inch, and ultimately to a pressure of 350 pounds per square inch for use in the locomotive; and by having an excess of receiver-room all difficulties of latent heat are avoided.

The cost of the locomotive was £250, and that of the compressor £70; and the engine does the work of the three 14-hand horses. The cost of producing an equal amount of power by means of electricity would be more than twice that sum, and the electrical leakage in coal mines would be an almost insurmountable obstacle to its use.

Steam hauling engines and compressed air locomotives, with the tail-rope system in use at many collieries, have proved so satisfactory and economical that the time has not yet arrived when electricity can be economically applied to take their place; whilst the transmission of power to fixed points in coal mines is undoubtedly best secured by means of compressed air, the exhaust of which is of such value for ventilating the workings.

Recapitulating the points mentioned, the writer advocates the use of electricity for the purposes of signalling and illumination, as regards the pit-bank and pit-bottom; but cannot at present approve its adoption for the transmission of power in the workings, or for illumination as the working applies equally in the matter of electric-light machinery. The writer has brought the subject before the institution, after several years' experience, because he is impressed with the present inadequate signalling arrangements, and the increasing risks to which all classes of underground men are exposed by the introduction of rapid-winding machinery on engine-planes where mechanical signalling is used. On the other hand, the application of electricity for surface illumination is only a convenience and not a necessity; while for underground illumination the writer adheres to self-extinguishing safety-lamps.

Telephonic.

The Clambake.

MR. EUGENE F. PHILLIPS'S FIFTH ANNUAL SPREAD—THE HOST AND HIS GUESTS.

PROVIDENCE, R. I., August 18, 1883.

For five succeeding years Mr. Eugene F. Phillips, president of the American Electric Works, has generously provided a day's sport and recreation for his friends among the electrical people These entertainments have consisted of a sail from Providence down the river to some favorite resort, the provision of various means of sport, and an ample store of good things to eat; the latter is a special feature of these "parties," and consists of that essentially Rhode Island institution, the "clambake." To one who has passed through one of these feasts, nothing remains to be told; but to those who have never partaken of this local dish, or dishes, nothing can be said. To use, if I may, Mr. Editor, a common phrase, "Life's too short." They are deliciou-ly inexplicable. This has been my experience at this "bake," and with the genial Phillips to provide and to preside over the palatable courses as they came to us to-day, nothing was wanted to melt the ordinary coldness of everyday life into the warmth of forgetfulness and joy.

The guests assembled in the Providence telephone office, going thence by hourly boats to Silver Spring, an excellent resort about a half hour's sail down the Providence River. After landing, a short walk brought them to the Vue de l'Eau Club-house, where they were handsomely welcomed by the President assisted by many numerous courteous lieutenants, including Col. A. C. Eddy, of the Club; Major Henry C Bradford and Messrs. J. O. Darling and F. H. Angell, of the electrical works. Among the company were the Hon. Henry Lippitt, the Hon. Thomas A. Doyle, Henry W. Pope, president of the Manhattan District Telegraph Company, of New York; Emil Berliner, electrician; Geo. W. Pierce, R. W. Devonshire, of the American Bell Telephone Company; George H. Cary, general agent of the Cary Telephone Signal Company, Boston, and James H. Cary, the inventor of this excellent signal system; J. A. Sherman, superintendent of the Rapid Telegraph Company, New York; G. M. Robertson, representing the Western Union Telegraph Company, New York; E. V. Cherry, vice-president of the Standard Electrical Works, of Cincinnati, O.; J. H. Lounsberry, manager of Western Union Telegraph Company, Hartford, Conn.; H. C. Haskins, of the Northwestern Telephone Company, Milwaukee, Wis.; S. M. Cortright, of the Central Pennsylvania Telephone Company, Allentown, Pa.; M. W. Goodyear, representing L. G Tillottson & Co. of New York; E. B. Baker, Superintendent of the Southern New England Telephone Company at New Haven; Abner Coleman, Superintendent of Fire Alarm at Taunton, Mass.; W. D. McKinney, of the Telephone District Company, Boston; Charles Sylvester, of the Fall River Telephone Company; A C. White, Electrician, and J. W. Duxbury, General Manager of the Providence (R. I) Telephone Exchange.

The company was supplied with novel badges, consisting of a clam-shell suspended by electrical wire from a silver pin, and bearing a black ground on a red ribbon the words:

"American Electrical Works, Fifth Annual Bake, Providence, R. I."

Lunch was served at 1 o'clock, President Phillips making a neat little speech introducing ex-Governor Lippitt, who completed the words of welcome by an admirable address.

THE SPORTS.

After lunch the gentlemen repaired to the grounds, where innumerable sports were set in motion, such as foot-ball, base-ball, archery, wheelbarrow racing blindfolded, and closing finally with shooting at clay pigeons.

The ball nines were captained respectively by Messrs. John Darling and Fred. Angell, of Providence, the latter's nine winning in five innings by a score of 10 to 7.

About 3 o'clock another Boston delegation arrived, headed by H. B. Lytle, of the Boston Telephone Dispatch Company, and Colonel J. N. Keller, late General Manager of the Southwestern Telephone Company.

At 3:30 o'clock Steward Boyden, of the Vue de l'Eau Club, sounded the gong for dinner, at which time 93 names had been registered on the book.

THE DINNER.

On coming to order at the regular dinner, President Phillips called upon the Hon. Thos. A Doyle to perform the invitation ceremony which he did in his happy way, combining brevity with wit and pointed sense.

After dinner, which was most excellent and ample in its appointments, a supplementary desert was served by Henry H. Sherman, the regular assistant commissary on these reunions, and the company again adjourned to the grounds to continue their out-of-door fun.

AFTER DINNER RECREATIONS.

In the pigeon shooting Mr. George W. Gardner, of Providence Telephone Company, carried of the honors. When the out-door sports had become tiresome the entire company entered the club room and passed the time in waiting for the "What-cheer" in talking business, telling stories, singing and speech-making, during which a poem, recited by George H. Cary, Boston, was the cause of most vociferous applause. At 7 o'clock ex-Gov. Lippitt took his departure in his yacht "Social," the telephone men gathering on the wharf at Silver Spring to cheer him on his way, and their cheers were responded to by a salute. In fifteen minutes more the purser of the "Whatcheer" had said his "Hello!" to the party, and at 7:45 three rousing cheers for President Phillips, of the Providence Electrical Works were given at the wharf in Providence. Arriving in the city, the electricians accompanied Captain Reginald Brown to the Dyer street station of the Rhode Island Electric Light Company, to inspect operations there, after which the visiters from abroad were entertained in various ways by their Providence friends, until train time or hotel bed-time.

WHO WERE THERE.

Besides those mentioned above were the following gentlemen who represented their various localities in exceedingly admirable style: Chas. W. Lippitt, treasurer of the R. I. Electric, Geo. D. Micholls, C. R. Remington, Henry H. Sherman, Thos. L. Reed, Wm. H. Kenyon, W. H. Sawyer, secretary, and treasurer of American Electric Works; E M. Carhart, Frank E. Durfee, Augustus Wright, W. H. Anthony, Clinton Moran, A. L. Sherman, E. C. Perkins, Doctor F. H. Peckham, H. C. Beckford, H. W. Breckinridge, E. B. Phillips, N. C. Langstaff, Chas. G. A. Peterson, E. J. Smith, A. B. Searles, H Zwidore, F. H. Cushman, W. A. Hatheway, E. C. Winn, Abott H Thornton, H. H. Harris, J. F. Hedge, Jr., Mark A. Evans, Daniel Field, James Greenalge, Daniel I. Grimm, Herbert Phillips, Thos. E. Eddy, all of Providence. Charles Carroll represented the Providence *Press*, and Thomas P. McElroy the *Daily Journal*. A. H. Chapman, of private line department Telephone Despatch Company; Geo. T. Manson, Supt. Suburban, Geo. E. Hanson, superintendent Somerville district; J. F. Hyland, manager of Cambridge Exchange; J. J. Carty, superintendent operating room Telephone Despatch, Boston; Geo. W. Blodgett, electrician B. & A. R. R. Co.; Aaron D. Blodgett, Geo. W. Adams, J. W. Peck, all of Boston. From New York came C. H. Sewall, A. L. Bogart, H. G. Runkel, Thomas Stead. John Hale, Warren, R. I.; J. Jepson, Putnam, Conn.; A. C. Newcombe, Springfield, Mass.; E. M. Wilson, electrician, Worcester, Mass.; William Brophy, Worcester, Mass.; M. G. Parker, Lowell, Mass.; L. W. Breckenridge, Brookline, Mass.; W. S. Crofut, Walpole, Mass; W. K. Wagner, New Bedford, Mass.; D L. Mitchell, C. M. Rhodes, and I. M. Pierce, Taunton, Mass.; N. Raukin, Port Henry, N. Y., and Stephen M. Canty, late general agent for Davis & Watts of Baltimore, Md.

Thus endeth the clambake for the year 1883, and those who participated will carry with them for many months and years the remembrance of a fine day's sport, and the most grateful thanks for our generous host President Eugene F. Phillips.

A telephone cable of twenty wires has been laid in the channel at Hartford at the east end of the railroad bridge. Hitherto the wires were liable to be cut when vessels passed through the drawbridge, and that inconvenience is now entirely obviated.

A Telephone Line to Delta.

The officials of the Maryland Central Railroad have signed a contract for the construction of a telephone line from Baltimore to Delta, Pa., along the line of the road now in operation to Belair. The line will be a double one of two wires, and will be stretched on poles thirty-five feet high. Transmitters will be placed at every station on the line, and it is understood the telephone company will also make arrangements to make connection with any private houses that so desire.

Frank B. Knight, Esq., special agent of the American Bell Telephone Company for the Rocky Mountain district and territory lying west of the Mississippi River, is spending two weeks at Ocean Grove with his family.

General Manager H. B Lytle, of the Chesapeake and Potomac Telephone Company, will make his headquarters in Boston instead of Baltimore.

Charles J. Glidden, Esq , and family, and Mr. A. A. Colburn and family, of the Lowell Syndicate, are spending a short vacation at Elberon. The secretary always comes to front smiling and happy, and does not appear as though he needed any vacation at the sea-side.

Major Downs, of the Lowell Syndicate, and Colonel Keller have gone to Nantasket Beach for a few days' recreation.

Telephonic Connection.

LEBANON, ILL., August 7.—Lebanon now maintains telephonic communication with Belleville and many other towns in St. Clair County, thanks to the energy of the Bell Telephone Company of Missouri. An office has been established at Sager's hardware store, and business men are already availing themselves of its superior advantages. Mutual congratulations were exchanged yesterday with Belleville, O'Fallon, Freeburg, French Village and Caseyville. Our people are elated over its success.

The Proposed Consolidation of the New England Telephone Companies.

A largely-attended meeting of the stockholders of the Southern New England Telephone Company was held at New Haven August 14 for the purpose of empowering the directors to ratify the proposition for a consolidation of all the New England telephone companies.

The plan is to form a new company, having a capital of $16,000,000, of which $8,000,000 goes to the American Bell Company for its plant and franchises in Boston.

A careful examination of those properties has been made, and it has been found that they will earn something more than 6 per cent. on $7,000,000. The division of this $7,000,000 to the different companies has been upon the basis, substantially, of their earnings, each company receiving so much of the stock as would represent the capital upon which it is now earning 6 per cent. net. The proportion allotted to the Southern New England Telephone Company is $1,679,500, or $185 per share, all properties to be taken as of the 1st of July, free of debt and without other assets than the plant. The remaining $1,000,000 of stock is to be issued for cash as working capital.

Of the stock issued to the American Bell Company dividends as such are waived for three years. After paying 6 per cent. the first year to the stock other than the $8,000,000 owned by the American Bell Company, the surplus net earnings, if any, to an amount not exceeding $60,000, are to be paid to the American Bell Company. The second year's surplus, not exceeding $120,000, and the third year's surplus, not exceeding $180,000, are to be paid to the same company. Beginning with the fourth year the American Bell Company's stock is entitled to participate in dividends at the rate of $100,000 a year, and to take up surplus to the amount of 6 per cent. on $300,000 up to and including the eighth year. In the ninth and tenth years its right to surplus is diminished to 6 per cent. on $200,000 and $100,000 respectively, and in the eleventh year all stock is to participate alike.

The stockholders unanimously voted in favor of consolidation and to buy 400 shares of the new stock. About ⅗ths of the capita stock of the company was represented at the meeting.

Telegraph Line in China.

Since the destruction of the short railroad from Shanghai to Wusung by the Chinese shortly after its building in 1877, it has been thought that there would be opposition to further introduction of foreign contrivances; and two years ago, when the construction of a telegraph line was begun between Shanghai and Tientsin, a party of soldiers was detailed to guard the foreign engineers employed on it. The caution proved unnecessary; and the chief difficulties encountered were the numerous canals, some of which had to be crossed by cables. The want of good roads was a serious embarrassment when the line ran at a distance from the grand canal. The line is 938 miles in length, and required nearly twenty thousand poles. The construction was begun in June, 1881, at the two termini, and in December was opened to public use.

Bankers' and Merchants' Telegraph.

It is claimed that the telegraph strike will give the Bankers' and Merchants' an average increase of 150 per cent. in business. The lines are being worked to their full capacity. The duplex system is worked on every wire. The consolidation of the Bankers' and Merchants' and the Southern Telegraph means an extension of the Bankers' and Merchants' line from New York to New Orleans *via* Charleston and Savannah, making a total of about ten thousand miles. The Southern Telegraph Company's wires are built to the suburbs of the cities of Charleston and Savannah. The heart of these cities will be reached in about two weeks. The policy of the Southern Telegraph Company will be continued under its new management. Even the name will not be changed.

The price at which the Bankers' and Merchants' secured control of the stock of the Southern Telegraph has not been made known. The stock of the Southern Telegraph Company amounts to $5,000,000. It has not had any market value, simply because the line was not finished. Banker's and Merchants' stock is selling at 25 per cent. premium. The new issue of 700,000 shares is being taken at this premium The new bonds of the Bankers' and Merchants' company have all been taken at par. They amount to $300,000, and are issued on their line from New York to Washington. The bonds date from July 1, 1883, run for thirty years, and bear interest at six per cent., payable in January and July. The company is stringing six additional wires between New York and Washington, which are to be finished within six days, and which will make a total between New York and Philadelphia of sixteen wires, and between Philadelphia and Washington of ten wires. The company makes a point by connecting its branch offices at business centers in this city direct with offices in business centers of other cities.

Musical Telegraphy.

We are pleased to publish the following from Dr. G. P. Hachenberg, of Austin, Texas, who has been making some experiments in musical telegraphy for some years past. We hope to give in another edition further information concerning it:

AUSTIN, TEXAS.

Professor Alexander G. Bell.

SIR,—Permit me to draw your attention to my system of musical telegraphy for concert purposes. I watched with much interest your experiments on the subject, as well as those from other eminent electricians. I have anticipated from these experiments, based upon telephonic principles, doubtful results.

More than thirty years ago my attention was directed to musical telegraphy. You may well imagine what precedence I had to go upon. So primitive was telegraphing then that the first part of my invention was the nomenclature itself. In my first studies on the subject I associated the waves of sound with the current of electricity – that is, the transmission of sound by electricity. As a factor for my research, I took it for granted that such a thing was practicable in nature; but I soon discovered that electricity, as a sound carrier, would serve me no good, practical results, and then and there I dropped it. My final conclusion was, that the only way that musical telegraphy can be developed to render favorable results is mainly to depend on electro-dynamic operations, or a combination of musical instruments electrically connected, controlled by one performer. The most available instruments for this purpose are pianos, organs, bells, etc. The expression—or, rather, the individuality—of this electro-music is not rendered by the performer, but by a musical director, who, through a keyboard of his own, makes and breaks the electrical communication between the instruments, to import volume and expression to the music.

In the published proceedings of the U. S. Centennial Commission for 1872, appendix No. 3, pages 92-3, you will see such details of this invention of mine as was proposed to make practical for the national celebration.

Recently a prominent business man in New York City was in communication with me to take up this matter again for the World's Fair of 1883, but as that enterprise came to an abrupt end, no further attention was given to it.

Perhaps the best encouragement I have received from scientists was from the late Prof. Henry, of the Smithsonian Institution, in the early years of my research in this matter. Whatever my own great expectations were in regard to this invention, they have hardly been less sanguine than expressed in several of his communications to me. He had the utmost confidence in the practicability of the invention, and with such wonderful results, he says, as could not be fathomed now from our present standpoint. Indeed, the late distinguished electrician looked through my invention far more intelligently than I could myself. I remember he laid great stress on the peculiar timbre credited by musical telegraphy, where the same note is expressed at once throughout the whole space of the hall.

On the 19th of February, 1873, I treated the subject of my invention, in its scientific aspect, before the Franklin Institute, Philadelphia, which attracted considerable attention in that city.

You might ask the pertinent question, How is it that so little was done in a cause that promised so much? I may intensify that inquiry when I tell you that I made the subject of musical telegraphy a public lecture, which I delivered in different parts of the United States, and published details of the invention in many papers of the country. I must confess that some of these communications received more attention in Europe than in this country.

The fault lies simply in this: Many intelligent persons admit the practicability of the invention *per se*; but they do not take into consideration that array of acoustics that come in as auxiliaries to render musical telegraphy a great success. This part alone will demand the most scientific attention, and will open a fine avenue for the inventor and the scientist.

Without going into any details, the use of these instruments to play accompaniments in vocalization would have the most wonderful effect of all. By a telephonic arrangement the singing could be transmitted through the different instruments with a most pleasing harmonic effect, even if the instruments were not in action.

But even to know all this is not sufficient to fathom the strange results of musical telegraphy from our present position. But with these promises on your mind, set your imagination to work on any well-executed instrumental music, what the same would be rendered, say, from ten pianos electrically conducted, with sounds reaching the tympanum from different points, with its various expressions. Follow this music, but have a place for each note in this electrical circle of instruments. You will not make this experiment very often before you will catch a study in it that the mind will dwell upon with intense interest. You will light on a science that some day will revolutionize the art of music!

Now to go through all this trouble to see the nature of another's invention, is a thing hardly to be expected; but as the only prospect I see to favor the introduction of musical telegraphy is to receive the friendly cooperation of those that can fully understand it, I tender you this communication. If capitalists see that the enterprise has the confidence of scientific men, and that investments in it are likely to pay well, they will not withhold their strong arm of support from it.

I am, sir, respectfully, your obedient servant, G. P. HACHENBERG, M. D.

PIGEON COVE, CAPE ANN, MASS.

Dr. Hachenburg, Austin, Texas.

DEAR SIR,—I have read with much interest your communication to me of the 10th instant, concerning musical telegraphy for concert purposes, and have no doubt that very beautiful and wonderful effects would be produced by a combination of musical instruments electrically connected and controlled by one performer, as you suggest.

Your letter does not give me any idea of the details of your proposed arrangement, but I am so much interested in the matter that I shall examine, at the earliest possible moment, the publications to which you have referred me.

I remain, sir, yours truly,

ALEXANDER GRAHAM BELL.

Master Workman Campbell Declares the Strike a Failure.

MEMBERS OF THE BROTHERHOOD AUTHORIZED TO GO TO WORK - GIVING THE WOMEN FIRST CHANCE FOR PLACES.

Master Workman John Campbell of the Brotherhood of Telegraphers went from the Manhattan Hotel to the Western Union receiving room at 2 o'clock on Friday afternoon last and sent the following message to Mr. Thomas Hughes of Pittsburgh, the General Secretary of the Brotherhood:

Send following to all assemblies:

"The Executive Board of the Brotherhood regrets to say that the strike is a failure. All members who can may return to work immediately. A circular follows by mail."

JOHN CAMPBELL

A similar message was sent direct to officers of local assemblies in the leading cities.

The New York Assembly of the Brotherhood was in secret session at the time in Clarendon Hall. Six hundred operators and linemen were present. Chairman John Mitchell read this message:

To all Members of the Brotherhood of Telegraphers, greeting:

After a struggle of one month, in which you have shown yourselves true men and women, and worthy of the respect of the people of this country, we are compelled to acknowledge that our struggle for our rights is a failure. All members of this Brotherhood are at liberty to return to work after 3 P. M. to-day. For the Executive Board,

JOHN CAMPBELL, D. M. W.

Half a dozen men jumped to their feet shouting that they would not return, and that the fight was not over. There was a good deal of shouted disapprobation of the action of the Board. Chairman Mitchell finally obtained silence, and appointed a committee of three operators to escort the lady strikers to the Western Union building in order to give them the first chance to get work. None of the men left the hall for several hours after the departure of the women. The linemen were very bitter in their strictures on the order to return to work, and laid the blame of the failure to the "kid glove operators." Mr. Smith, chief of the linemen, said that as far as they were concerned the order would be ignored. A vote was taken, and the linemen unanimously resolved to continue the strike, and, as one of them remarked, "to make it hotter than ever."

The committee of three meanwhile escorted thirty-eight women to the Western Union office, where the women applied for reinstatement. Only eight were taken back, the others being told that their places has been filled. Several of the applicants cried.

"The majority of those you see here were strikers," said Night Manager Sink to a reporter standing at the door of the operating room Friday night. "Forty-five were taken back, of whom eight were women. Half a dozen men were rejected. Many of the best of the operators are staying away so as to give the women the first chance. They have always acted like honorable men. The night gang is full without using extras.

All the men had not waited for the women, however. By 3 o'clock in the afternoon thirty-one operators had applied for work and got it, and six had been rejected.

Mr. Bogart, who has charge of the linemen, said that in all four striking linemen had applied for work since the strike. They had not been taken back. A few specially skillful men would be taken back if they applied. The rest were hopelessly out of it so far as that company was concerned. Mr. Bogart said that the plant had not depreciated.

Master Workman Campbell sat in a window at the Manhattan Hotel last night, and talked coolly of the failure of the strike. He said that when it began more than 6,000 operators left their keys. Until within the last three days not over 200 of them had returned to work, except those ordered back to the American Rapid Company. The average pay of the 5,000 operators who were out the whole twenty-nine days was about $50 a month. They lost in pay $250,000, and in all about $400,000.

CHATTANOOGA, TENN., August 13, 1883.

DEAR SIR,—On page 10 of your issue of August 9 you say: "A special from Atlanta, Ga., says that at 10 o'clock this A. M. a pistol ball was fired through the window of the Western Union telegraph office here, shivering the plate glass and striking receiving clerk 'Witt' above the hip. * * * Witt withdrew from the Brotherhood the day before the strike." A casual reader would naturally infer that the Brotherhood fired the shot, when, in fact, the ball came from an air gun in the hands of a small boy stopping at the Markham House—an accidental shot. Believing you do not wish to injure any member of the Brotherhood, I hope you will correct. Yours, H. G. COMSTOCK.

Major Downs, or some other poet says, beautifully,

Obey
Thy genius, for a minister it is
Unto the throne of fate.

If, however, you have a genius for taking things which don't belong to you, and if you are marked by nature as a man who can pick a bank lock with a nail, the more you repress your genius the less likely you are to leave your country for your country's good.

Colonel J. K. Keller, formerly general superintendent of the Southwestern Telegraph and Telephone Company, is spending a few weeks at Ocean Grove. We hope the Colonel will soon be heard from again in the telephone field. He has well earned a brief vacation at the seaside.

Postal Telegraph Company.

The Board of Directors of the Postal Telegraph Company met in the office of the company, No. 49 Broadway, Wednesday last, for the purpose of accepting the resignation of Joel B. Erhardt as president and director of the company. It was reported, and the report was not denied by officers of the company, that John W. Mackey, the California millionaire had purchased a large amount of stock in the new company, alleged to be $500,000 worth, and that at the meeting of the Board this afternoon he would be elected a director and also be chosen president in Mr. Erhardt's place.

One of the officers of the company said: "On Monday last, the day the company began sending messages to Chicago, we sent 438 messages. Yesterday the number forwarded was 1,364, and our business is increasing every day. I have been connected with many telegraph companies, and have built a number of lines for the Western Union, and I have never known a company to start under such favorable auspices. We have two copper wires working to Chicago. Our lines are built in the best manner, and the cost of maintenance will, therefore, be much smaller than on other lines. Despite the fact that we are only transacting business in the daytime, the receipts for the first month will be sufficient to pay the running expenses. Every other new line that has been started in this country has failed to pay expenses for the first six months or a year.

"As soon as the Board of Directors is reorganized, the work of pushing the lines to other important points will begin. We shall increase the number of wires to Chicago, and from that point extend our system to St. Louis, Omaha, and thence to the Pacific Coast. Lines to Boston, and from that point to Maine, will be constructed, and at the Maine end connection will be made with the new cables. We shall also construct a line to the South, with branches to all sea coast and gulf cities, and the principal inland cities in the South, and shall make connection with the South American telegraph system. Afterward we shall construct a line to Cincinnati, Louisville, Nashville, and Memphis, thence running south to New Orleans."

In regard to the report that Mr. Mackey had purchased $500,000 of the stock of the company, the officer quoted said that he could not state the amount, and could only say that the company had disposed of $1,000,000 of stock in the last week, of which Mr. Mackey had taken a large share. George D. Roberts and L. C. Horton being among the other purchasers.

LATER.

The meeting adjourned shortly after two o'clock. Mr. Cummins, the vice-president, said that the resignation of President Erhardt was accepted, and that Mr. Mackey was elected a member of the Board. No one was chosen to the presidency of the Board, Mr. Mackey declining the position, because of the many other offices he held. Mr. Cummins also said that the company's receipts for the coming month would undoubtedly show a surplus over all expenses, and that the company had sufficient funds to push forward the system to all important points. He added that the present tariff or rates would be maintained.

The election of Mr. Mackey as a director of the Postal Telegraph Company was announced on the tape before two o'clock. The capital stock of the Postal Telegraph Company issued is $19,000,000, of which $12,000,000 are in the hands of George S. Coe, representing a pool to be controlled by Coe and Mackey.

Of the rest, $1,000,000 are first mortgage gold bonds, six per cent. to secure which a mortgage of $10,000,000 has been filed, covering factory in Ansonia and all lines. Three millions of bonds have been issued to create a working capital, and 7,000,000 remain in the treasury of the company. J. W. Mackey, H. L. Horton, and G. D. Roberts obtained $1,000,000 of remaining bonds yesterday.

Mississippi steamers are beginning to adopt the electric lights. One of them carries a deck light of 8,000-candle power.

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NEW YORK, AUGUST 23, 1883.

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The Utilization of Natural Forces.

The coming historian must surely have much to say concerning the dynamo-electric machine and the electric accumulator. The work now performed by these admirable contrivances, important as it is, must needs look insignificant as compared to what they are likely to do a hundred years hence.

The subterranean coal stores of the world are becoming exhausted surely, and not slowly, and the price of coal is upward bound—upward bound on the whole, though, no doubt, it will have its ups and downs in the future as it has had in the past, and as must be the case with every marketable commodity. When the coal is all burned, or long before it is all burned, when there is so little of it left and the coal mines from which that little is to be excavated are so distant and deep and hot that its price to the consumer is greatly higher than at present, it is most probable that windmills or wind motors in some form will again be in the ascendant, and that wind will do man's mechanical work on land at least in proportion comparable to its present doing of work at sea.

Even now it is not utterly chimerical to think of wind superseding coal in some places for a very important part of its present duty—that of giving light. Indeed, now that we have dynamos and accumulators, what little would seem to be necessary to insure the success of the work is cheap windmills.

A Faure cell, containing twenty kilogrammes of lead and minium, charged and employed to excite incandescent vacuum lamps, has a light-giving capacity of sixty candle hours. The charging may be done uninjuriously, and with good dynamical economy, in any time from six hours to twelve or more. The drawing off of the charge for use may be done safely, but somewhat wastefully, in two hours, and very economically in any time, of from five hours to a week or more. Calms do not often last longer than three days at a time. Suppose, then, that a five days' storage capacity suffices. One of the twenty kilogramme cells, charged when the windmill works for five or six hours at any time, and left with its sixty candle hours' capacity to be used six hours a day for five days, gives a two-candle light.

Thus, thirty-two such accumulator cells so used would give as much light as four burners of New York sixteen-candle gas. The probable cost of dynamo and accumulator does not seem fatal to the plan, if the windmill could be had for something comparable with the cost of a steam engine capable of working at the same horse-power as the windmill when in good action. But windmills, as hitherto made, are somewhat costly, and it does not seem probable that, without inventions not yet made, wind can be economically used to give light in any considerable class of cases, or to put energy into store for work of other kinds.

Another practical source of energy are the tides. A tide of two meters' rise and fall, if we imagine it utilized to the utmost by means of water-wheels doing with perfect economy the whole work of filling and emptying a dock basin in infinitely short times at the moments of high and low water, would give just one meter ton per square meter of area.

A dock area of 162,000 square meters (which is a little more than 400 meters square) is required for one horse-power. This, considering the vast costliness of dock construction, is obviously prohibitory of every scheme for economizing tidal energy by means of artificial dock basins, however near to the ideal perfection might be the realized tide-mill, and however convenient and non-wasteful the accumulator—whether Brush's electric accumulator or other accumulators of energy hitherto invented—which might be used to store up the energy yielded by the tide-mill during its short harvests about the times of high and low water, and to give it out when wanted at other times of the six hours. There are, however, many places where it would be advantageous to build a sea wall across the mouth of a natural basin or estuary, and to utilize the tidal energy of filling it and emptying it by means of sluices and water wheels; but if so much may be done, it would in many cases require but little more to keep the water out altogether, and make fertile land of the whole basin. Thus we are led up to the interesting economical question as to whether 162,000 square meters or 100 horse-power is the most valuable. In such a country as ours, where land is cheap, it is safe to say that the 100 horse-power would prove the most valuable.

The improvements being continually made, not only in the construction of windmills and tide locks, but also in the accumulator and the dynamo, render it almost certain that both of the former will, at no distant day, be rendered economical generators of electrical power.

The Scholastic Prelude to Modern Science.

There was a time when it was supposed that theology comprehended every other science, and physics was framed in the same spirit as theology. All physical science was supposed to be founded on certain mental concepts, which were supposed to be real. But all reference to Nature herself was prohibited, as savoring of heresy and from fear of contradicting some doctrine of theology. Aristotle's theory of matter and form was adopted—the matter being the physical substance and quality of things, and form being that which distinguishes them into different classes.

Thus, all physical science was reduced to syllogisms; and it was supposed that, by varying these, all physical truth might be discovered. The system was, therefore, entirely *a priori;* it began with the highest abstractions—pure fictions of the mind—and reasoned deductively from causes to effects. By this means the idealism of Plato, together with the logic of Aristotle, was utilized in the service of the Church, and the union of the church and philosophy was irresistible and enthralled the human mind for three centuries.

Thus, the logic of Aristotle, which was never intended as anything but a defense against philosophical error, was turned into a system for the discovery of truth and scientific investigation. Aristotle himself would have been the first to protest against the misuse of it. The labors of the men were prodigious, but they were utterly barren of results—as barren as the labor on the tread mill.

All this and much more is shown by Henry Duncan Macleod in his "Elements of Economics," a work of great interest, in which he indicates the wonderful change which in the latter half of the sixteenth century came over the spirit of the nation when it then held the foremost place in culture and civilization.

After twelve centuries of existence, he says, the Niobe of nations had fulfilled her destiny. By the middle of the fifth century her empire, which had extended from the Euphrates to the Tagus, and from the Forth to the cataracts of the Nile, had seen province after province rent away from her and had shrunk within the limits of Italy. Rome, which had not seen a foreign foe for seven centuries, had been four times sacked by the barbarians. The free yeomen of the bright days of the republic had perished in the civil wars. The land was parceled out among a small number of gigantic proprietors and cultivated exclusively by slaves. Tillage had nearly ceased, and all the supplies of corn came from the provinces. War, pestilence and famine desolated whole districts.

In 476 the mercenary barbarians which composed the army demanded that one-third the lands of Italy should be divided among them.

The refusal of the Emperor led to his final abdication, and Odoacer, the military commander, reigned in Italy.

Finally, as we know, a new swarm of barbarians under Theodoric conquered the country; then came the new host under Alboin, King of the Lombards, who was overthrown by Charlemagne and the Franks, who was in turn succeeded by the Germans under Otho the Great.

Thus, after the gestation of five centuries the convering races and the conquered had become amalgamated into one people, and a new nation arose which exhibited such a transformation which had never before been exhibited in the history of the world. The land; which had been held by the most prosaic and unimaginative of nations became the mother of all the arts and all the sciences. But when the Hohenstanfens, a more energetic race, succeeded Frederic Barbarossa, one of the ablest sovereigns of the middle ages, attempted to reimpose upon them the yoke of empire, he was vanquished, as we know, upon the field of Legnano in 1176, and Italy became independent.

It was about this time that the energies of the people began to develop themselves.

First architecture, then sculpture, then painting, then poesy was called into existence, and during the space of four centuries Italy produced such a galaxy of illustrious names in the arts as no other country can boast. The powers of nature seemed to culminate in Michael Angelo and then decayed.

The day that Michael Angelo died, Galileo was born. His first discovery, as we know, was in 1582, when he was led to infer the isochronism of the vibrations of the pendulum by noticing the regular swinging of a lamp in the Cathedral at Pisa. The principle, as all mechanics know, does not rigorously hold true when the arcs of oscillation are long and very unequal, but though it was fifty years before the philosopher applied his discovery to clock-work, it at once perceived its importance and caused it to be employed by physicians in counting the pulses of their patients. Sometime afterward, having read the treatise of Archimedes on floating bodies, he invented a hydrostatic balance. He refuted the maxim that the velocity of falling bodies is proportional to their weight by letting fall unequal weights at the same time from the top of the leaning tower of Pisa, explaining that the trifling difference in time noticed in their respective descents was owing solely to the resistance of the air. Then followed these other great discoveries to which so much of the science of to-day is based.

Bi- and Quadrupedal Enemies of the Telegraph.

It has been observed that that portion of telegraph poles to which the insulators are affixed is often covered with holes, sometimes being almost perforated. There have been many surmises as to the cause of this, but it has, it seems, been left to M. Nielsen, director of the Norwegian telegraph lines, to clear up the mystery. Nielsen recently published a curious note upon the impressions that are produced upon animals by the vibrations of telegraphic wires. The posts in the neighborhood of the Norwegian pine woods, even those which have been freshly impregnated with sulphate of copper, are frequently found to have been perforated by wood-peckers, which, it seems, mistake the humming of the wires for the buzzing of insects. The holes are generally made near the insulators, and a post shown at the Paris Electrical Exhibition clear through it and large enough to insert the whole arm. Bears imagine the humming to be that of bees, and not finding any sign of a colony above, paw at the heaps of stones at the base of the poles, and when they can find nothing, vent their spite in a vigorous blow on the ground to kill the bees that persist in staying hid. The scattering of the heaps of stones around the posts, which is by no means rare, could not be explained till some one perceived the marks of the bears' claws where these desperate blows had been given.

Wolves are believed to be frightened away by the lines.

While a vote was pending on a grant to a telegraph line, a member of the Storthing remarked that while his constituents had no direct interest in the line they would support the grant, because the wires would drive away the wolves. It is said that however hungry a wolf may be he will never go into a spot that is enclosed by ropes stretched on posts. It is a remarkable fact that since the first telegraphic line was established twenty years ago, wolves have never appeared in its neighborhood.

However this may be in Norway, it is to be regretted that the wires do not intimidate a certain description of wolf which has recently appeared in Westchester County, in New Jersey, and in other parts of the country. This species of wolf is looking neither for insects, like the birds, nor honey, like the bears. His only desire is to injure his former employers by damaging their property and impeding the despatch of their business.

Electrical Notes.

The dynamo of Gramme and Siemens and others made here since the discovery of the fundamental principle give now a ready means of utilizing economically on a large scale for many important practical applications the old thermo-dynamics of Joule in electro magnetism; and, what particularly concerns us now, they make it possible to transmit electro-magnetically the work of waterfalls through long, insulated conducting wires and use it at distances of fifties or hundreds of miles from the source with excellent economy.

***

Better economy, indeed, in respect to proportion of energy used to energy dissipated than almost anything known in ordinary mechanics and hydraulics for distances of hundreds of yards instead of hundreds of miles.

***

And the economy of electric work, as discoveries come, becomes more and more apparent.

***

It is well known that resonances in public halls can be modified or prevented by stretching wires across the ceilings, and the principle has been rudely applied in a number of instances with fairly satisfactory results.

***

An Englishman has invented a plan for a systematic arrangement of steel plates or wires which promised to accomplish the object more completely.

***

The effect of the plates is to take up the most gentle vibrations and greatly to increase the speed of transmission.

***

Wires have a similar quality and are more convenient.

***

In the most advantageous application of the new system one or more layers of steel wires are stretched along the length of the room a few feet below the ceiling, connected by cross wires and spiral springs and properly tuned so that the vibration may be absorbed and conveyed from one wire to another and instantaneously spread over the whole building, and the words of the speaker or the notes of the singer are so accelerated that they reach the audience about fifteen times more quickly than under ordinary arrangements.

***

The effect is improved and the tone enriched by using steel plates.

***

The system has been applied—imperfectly, for the wires had to stop short of the wall at one end—in the lecture room of the South Kensington Museum, of notoriously bad acoustic properties.

***

Twenty-eight lengths of steel wire were stretched across a distance of sixty feet and connected at the end by steel wire springs.

***

Above them were three other steel wires, connected with the lower group, so as to form a perfect net-work of wires.

***

The effect was a complete distribution of the sound, so that a speaker at the lecturer's table could be heard distinctly in any part of the theatre, and all the acoustic defects of the hall were considerably mitigated.

***

M. Faye has explained why it takes sixty-nine and a half English miles to make a degree instead of sixty, as was probably intended when the mile was established.

***

The English geographers deduced their mile from Ptolemy, and Ptolemy refers to Eratosthenes.

***

Eratosthenes measured the arc of the meridian on the basis of the distance between Syene and Alexandria, in Egypt, which gave seven hundred stadia to the degree.

***

Ptolemy says that he verified the measurements of Eratosthenes, and found the same result, which he gives, however, as five hundred stadia to the degree.

***

The discrepancy arises from a change which took place in the standard of the foot—of which six hundred went to the stadium—during the four hundred years between Eratosthenes and Ptolemy.

***

Eratosthenes used the ancient Egyptian foot, which is shorter than ours, while Ptolemy used the Phileterian foot, which is longer than ours.

***

Making all allowance for this difference the two measurements agree.

***

The English geographers in making their calculation believe the Ptolemy had used still another foot, the Greek foot, which is one and a half hundredths longer than ours, but shorter than the one he did actually use.

***

If the English geographers of the sixteenth century had strained this valuation ever so little and had carried it to five one-hundredths, they would have found 630 English feet for the stadium, which they believed to be 600 Greek feet, and these 630 feet, or 210 yards, multiplied by 500 would give them 105,000 yards for the degree, and exactly 1,760 yards for the mile.

***

M. M. Macé and Nicati have found that persons with normal vision, when looking at the solar spectrum, form considerably different estimates of the distribution of light in it.

***

They have since experimented with four Daltonians, or color-blind persons, and observed that in three of them the vision of red was very feeble, that of yellow was normal, and that of green appeared to be even sharper than in normal-eyed persons, while in the fourth the conditions were reversed.

***

Between Daltonians who could not perceive red, differences were noticed in the powers of vision of blue and violet, similar to those met in normal eyes.

***

M. Charpentier has experimented by looking in darkness at an opaque screen perforated by a number of minute holes, which were distinguishable in a moderate light, and learned that a very faint light merely produces a diffuse luminous sensation; a greater quantity of light gives the notion of color, if color is present; and a still greater quantity is required to produce the perception of form.

***

Attempts have been made in England, applying the principle of the Bessemer process, to facilitate the extraction of copper from the sulphuret by blowing air into the pyrites, in order to consume the sulphur and make it, at the same time, a source of heat for the continuance of the process of reduction.

***

They have failed because the bath would lose its heat as soon as the sulphur was consumed.

***

The discovery has been made in a factory at Lyons, France, that the presence of a compound containing phosphorus will protract the continuance of the required temperature till the process is completed.

***

The order of the combustion appears to be first of the sulphur, next of the metallic impurities, lastly of the phosphorus.

***

One of the most interesting phenomena of electricity is its influence on plant life.

M. Déhérain recently published the results of experiments conducted by him on this subject.

***

In a conservatory set apart for the purpose, plants were disposed in four groups, each receiving a different treatment.

***

One group was deprived of the light of day and was exposed to the electric light all the time; another had the diffused daylight weakened by having to pass through the glass roofs of the conservatory, by day, and the electric light at night; a third group had only the diluted daylight by day and was left in the dark at night; and the fourth group, kept during the day in a shaded garden-bed, and was taken into the conservatory and exposed to the electric light at night.

***

Some plants which were taken into the conservatory a few days before the electric apparatus was put in operation suffered badly from the deficiency of light—much more than the experimenter had anticipated they would.

***

The plants that were constantly exposed to the electric light became marked with spots, and began, in the course of eight days, to give evidence of having received serious injuries.

***

That the spots were caused immediately by the light, and not by the disengagement of nitrous vapors, was shown by the fact that only the leaves and parts of the leaves that were exposed directly to the light were touched.

***

This satisfied M. Déhérain that the electric light contains rays that are detrimental to plant life, and the facts indicate that these rays are the violet ones.

***

A direct trial of the capacity of the electric light to decompose carbonic acid was made, with the result that less gas was evolved from plants continuously exposed within twelve feet of the light for several days than is given out in an hour in the sunlight.

***

Plants that enjoyed the light of the conservatory by day and received the electric light at night suffered less, but were not healthy.

***

The electric light was enclosed in globes of transparent glass, and a new set of experiments was instituted with new plants.

***

The mischievous effects of the violet rays were no longer perceived, but the light was not capable of maintaining a healthy growth.

***

The plants started out well, but sent out long, thin shoots, which withered and died.

***

Nothing but barley reached a condition near maturity.

***

None of the plants would bloom, but some of them died at the top and took a new start from the root, to wither and die again.

***

Continued experiments showed that these results were due to the lack of power in the electric light to promote the activity of evaporation required to bring the plants to maturity.

***

The plants that were kept in the weakened, diffused light of the conservatory by day, and in the dark at night, fell into a gradual decay.

***

Those that spent the day in the shade out of doors, and the night under the electric light, did better, but not much better, than they would have done if they had been left undisturbed out of doors.

***

Mr. Déhérain concludes that the electric light has sufficient power to keep plants alive that would die in the dark, and that it exerts enough positive influence upon vegetation to account for the seemingly favorable results of M. Siemens' experiments, in which vigorous plants that had the light of day, and would have done well anyhow, were made to do better by being given also the electric light at night.

***

The alarm has been sounded in England against what is called a dangerous tendency in science.

***

Research, it is alleged, is being drawn into the hurry that characterizes other departments of life in our generation, and the glamor of sensational fame is too apt to blind the eye to the light of the solid honor which is the real and best reward of science.

***

"Apart," says a writer, "from other reasons, the difficulty, already great and always rapidly increasing, of ascertaining what is actually new in natural science; the liability at any moment of being anticipated by others, constantly present to the minds of those to whom priority is of serious importance, the desire to achieve something striking, either in principle or in mere illustration—all tend to disturb the even flow of scientific research.

***

"And it is perhaps not too much to say that an eagerness to outstrip others rather than to advance knowledge, and a struggle for relative rather than absolute progress, are among the most dangerous tendencies peculiar to the period in which we live."

***

It is known that Faraday, in 1850, observed that two pieces of ice brought in contact and subjected to pressure would be soldered together and unite in a homogeneous mass.

***

This soldering, which took place the more readily in proportion as the pieces of ice were nearer their melting point, was regarded by Faraday as due to a special property of ice.

***

Mr. W. Spring has recently undertaken a methodical series of experiments in the compression of a variety of bodies.

***

That their condition of division might be well established, he reduced the substances experimented upon to powder and subjected them, in a mould of steel, to a pressure of between two thousand and seven thousand atmospheres.

***

Filings of lead were converted at two thousand atmospheres into a solid block, showing no granulation under the microscope, with a density slightly above that of ordinary lead.

***

At five thousand atmospheres the lead became like a liquid and ran into all the interstices of the apparatus.

***

Powders of zinc and bismuth at five to six thousand atmospheres gave solid blocks with a crystalline fracture.

***

Approaching six thousand atmospheres zinc and tin seemed to liquefy.

***

Powder of prismatic sulphur was converted into a solid block of octohedric sulphur.

***

Slack sulphur and octohedric sulphur passed into the same condition.

***

Red phosphorus passed into the denser state of black phosphorus.

***

Thus simple bodies undergo chemical transformations under the simple action of pressure.

***

The transformation of amorphous powders

like that of zinc into crystalline masses, is a kind of auto-combination.

***

Some of the hard metals never lose their pulverulent structure under any pressure.

***

Powders of the bi-oxide of manganese and the sulphurets of zinc and lead solder under pressure and present the aspect of natural crystalline pyrolusite, blende and galena, while silicia and the oxides and sulphurets of arsenic do not suffer any agglomeration.

***

Some pulverized salts are solidified by pressure and become transparent.

***

Hydrated salts—as, for example, sulphate of soda—may be completely liquefied at a high pressure.

***

Certain organic substances—the fatty acids, moist cotton and starch—change their appearance, lose their texture and undergo a very evident molecular packing.

United States Postal Telegraph.

SENATOR EDMUNDS' ARGUMENT IN FAVOR OF GOVERNMENT LINES.

Some remarks of Senator Edmunds in reference to government ownership of telegraph lines are of special interest at this time. In speaking of this matter during the last session of Congress, Mr. Edmunds said:

"What the United States in regard to its postal affairs and the welfare of its people, needs to do more than anything else is the construction of a postal telegraph, beginning moderately, between the great points in the country and all intermediate points, and then extending it just as we have the mail system, as the needs of the community and fair economy would require, until every post-office in the country should have or be within immediate reach of a postal telegraph. That is what ought to be done and what will be done within a very few years, beyond all question. But I beg the stock operators in New York not to suppose that I for one am in favor of the United States buying out any telegraph company anywhere. I am in favor of the United States building its own postal telegraph and managing it in its own way, and leaving the gentlemen who are engaged in private pursuits to pursue their operations in their own way as private pursuits

"We introduced into the postal system not long ago a provision for carrying merchandise, but we did not think it necessary to buy out the operators of the Adams Express Company, or the Southern Express Company, or the Union Express Company, or the United States Express Company, and so on, although what we did very seriously diminished their profits and impaired their business. Everything that the United States does operates in that way upon the interests of its private citizens—everything except the appropriation for money directly. We cannot build a ship, we cannot build a post-office, we cannot do anything in the way of furthering the material interests of this country that does not, by just so much, interfere with the operations of the people engaged in that kind of transaction; there is no doubt about that. Therefore, I do not wish anybody to take up the idea that when (as I hope I shall be able to do if somebody else does not) at the session of the next Congress I propose the initiation of a postal telegraph for the United States that involves in any way dealing with any existing or to exist telegraph company, but involves the simple proposition of authorizing the Postmaster-General to buy the poles and the wires and the machines and set up his first lines along the great post routes of the country, North and South and East and West, and then, as time goes on and economy will warrant it, the extension of them to every hamlet in the country. Electricity is just as much a part of the forces of nature and of this world for the transmission of intelligence as a locomotive is, or as the old post-horse was, and it is too late at this day to say that because the world has advanced in the means of disseminating intelligence, the telegraph, under the Constitution of the United States, is not an appropriate means of the postal system just as much as it is to transmit letters."

A Just View of the Situation.

It is, perhaps, utterly vain to imagine that either the facts, which are abundant, or the arguments, that are absolutely conclusive, as to the solvent and hopeful condition of the country, after over two years of steady liquidation, will prevent the professional panic-makers of Wall street, or in the press, from occasional bearish bursts like that of last week. Still, it is just as well for all who are interested in the steady and prosperous development of our national resources, to once in a while think of the great underlying facts of the situation and to realize how essentially it differs from that preceding either the panic of 1873 or that of 1857. We have observed in our exchanges that discuss financial questions with the greatest intelligence and fairness, East and West, an almost universal inclination to regard the periodical Wall street excitements about a "panic" with contempt. In fact, the Philadelphia *Times* of this morning represents the average views of such journals in an editorial which makes this reference to the would-be panic-breeders of last week:

"They succeeded to some extent, of course; they tumbled fancy stocks which have little or no intrinsic value, and solid stocks sympathized with the market; but those who hoped for a panic and a general helter-skelter unloading were disappointed. Even the operators, who are the mere playthings of gamblers, were not ready for the expected sacrifice.

"The attempt to create a panic because of the leather failures of last week was simply an assumption that the people are stone-blind idiots, ready to sacrifice what they possess whenever the gamblers start a howl. The leather men failed just as all other people fail these days. There have been no failures for some years past, and there will be no failures for some years to come, in the channels of legitimate business conducted with ordinary intelligence and fidelity, except for the one cause of over production. If men will produce more than the world will consume, they must break."

This is a just and wise view of the situation, and is taken by 999/1000 out of every 1,000 men in the country who think at all about such questions. Specimens of the exceptional one-tenth of a man can be seen in Wall street any day when the "Rumor Committee" is very busy.—*Mail and Express.*

THE WESTERN UNION THREATEN TO SUE THE CITY FOR DAMAGE DONE TO THEIR WIRES BY THE STRIKERS.

General Superintendent A. S. Brown, of the Western Union Telegraph Company here presented to Mayor Edson, on the 14th inst., the appended document, accompanying it with a verbal statement in which he alleged that the company's wires were being cut, their business delayed and interfered with, and the officers themselves subjected to great anxiety by the strikers, and that the Company had been seriously interfered with during the past two weeks. The document read as follows:

The Hon. Franklin Edson, Mayor of the City of New York:

SIR: In pursuance of the statute of which a copy is hereto annexed, you are respectfully notified that a riotous body of men are threatening to destroy or injure the telegraph lines of this company in various places in the City of New York. This company has used, and is still using, all possible diligence to prevent such damage, but will be obliged to look to the City of New York for reimbursement for such losses as may be sustained beyond its power to prevent.

THE WESTERN UNION TELEGRAPH CO.,
By T. T. ECKERT, Acting President

Then followed a copy of chapter 428 of the Revised Statutes, passed April 13, 1855. It is entitled "An act to reimburse parties whose property may be destroyed by mobs or riots." So much of it as is alleged to apply to the case in point provides that any person or persons whose property, real or personal, may be destroyed or injured by the illegal acts of mobs or rioters may, after due notice be given, bring action against the Mayor of any city or Sheriff of any county to recover any losses sustained, after such notice is given. It also provides that these officers shall be empowered to collect such damages as are awarded after due proof, from the Treasurer of the city or county.

There is hardly a branch of the electrical field of so much importance, in mercantile centers at least, as a well-regulated time system, of which so much has been said in the REVIEW of late. An important addition to the merchant's and manufacturer's store or building is a carefully-kept watchman's time system. We were pleased to look over a system in operation in Boston, and find many excellent features about its operation to approve. The company operating the system is the Boston Electric Protective Association. Mr. John A. Ordway is president, Mr. Benjamin F. Dyer treasurer, and Mr. George W. Adams superintendent. It is but just to say that Mr. Adams has done the major part of the work—putting up lines and regulating the clocks, and keeping the system in perfect order. A large number of the bankers, dry goods merchants, dealers in jewelry and diamonds, and others are connected on the circuit, and speak highly of the efficiency of Mr. Adams' system.

Insulated Electric Wire.

One of the first men who ever made a yard of electric wire in the United States was the late Joseph Moore, who founded the business now carried on in Philadelphia by Alfred F. Moore, at 200, 202 and 204 North Third street. Joseph Moore began his work in this line in 1820, when there was but little known concerning electricity by even the wisest. He made the insulated wire used by Morse in the latter's experimental telegraph line between Washington and Baltimore, and since that time the house has been continually engaged in this line of business, and it is now not only the oldest and best known, but also about the largest house in the country in this particular line. They make electric light wire, telephone wire, telegraph wire, telephone and switch cords, flexible cordage, armature wire, silk and cotton magnet wire, office annunciator, and burglar alarm wire and electric cables.

The productions of the house are used by the majority of the telegraph, telephone and electric light companies all over the United States. The demands made upon the resources of the house have necessitated various extensions of facilities, and there are now occupied two large five-story buildings, 200, 202 and part of 204 North Third street, corner of Race, the whole fully equipped with the best and most improved machinery and appliances, designed specially by the house. A force of 75 to 100 hands is employed, and the productive capacity of the place is very large. The wires made are all 98 to 100 per cent. pure copper, and the high reputation they have gained for purity, high conductive capacity and strictly uniform quality is known to well-posted electricians everywhere. As a matter of course, the business has developed greatly during the last three or four years, owing to the requirements of the great number of concerns using electric wires that have come into existence. Mr. Moore is an able, energetic and popular man, and is very highly spoken of by all who come in contact with him.

In warning the veterans of the late war against exaggerating what they did and saw in it, ex-Governor Curtin at a Washington banquet related the following anecdote of a revolutionary veteran who, having outlived nearly all his comrades, and being in no danger of contradiction, rehearsed his experience thuswise: "In that fearful day at Monmouth, although entitled to a horse, I fought on foot. With each blow I severed an Englishman's head from his body, until a huge pile of heads lay around me, great pools of blood on either side, and my shoes were so full of the same dreadful fluid that my feet slipped beneath me. Just then I felt a touch upon my shoulder, and, looking up, who should I behold but the great and good Washington himself! Never shall I forget the majesty and dignity of his presence as, pressing his hand upon me, he said: 'My young friend, restrain yourself, and for heaven's sake do not make a slaughter-house of yourself.'" The shouts of laughter that greeted this story showed that the Governor had made a point.

Telephone Stock Quotations.

American Bell Telephone Company	256½
Bay State Telephone Company	123
Central New York Telephone and Telegraph Company	106
Boston and Northern Telephone Company	135
Empire State Telephone and Telegraph Company	203
Granite State Telephone Company	95
Hudson River Telephone and Telegraph Company	112
Long Island and New Jersey Telephone Company	102
Mexican Telephone Company	2½
National Bell Telephone Company of Maine	90
New York and Pennsylvania Telephone Company	100
Northwestern Telephone Company	100
Southwestern Telephone Company	68
Suburban Telephone Company	139
Southern Bell Telephone and Telegraph Company	125
Tropical Telephone Company	3
Central Union Telephone Company	110
Iowa Union " "	100
Missouri and Kansas Telephone Co.	100
United Telephone Company (Kansas and Missouri)	95
Bell Telephone Company, of Missouri	165
Wisconsin Telephone Company	125
Cumberland Telephone Company	105
Great Southern Telephone Company	102

The Man Who Stops His Paper.

Philip Gilbert Hamilton in his admirable papers on "Intellectual Life," thus talks to the man who "stopped his paper:"

"Newspapers are to the civilized world what the daily house talk is to the members of the household; they keep our daily interest in each other; they save us from the evils of isolation. To live as a member of the great white race of men—the race that has filled Europe and America, and colonized or conquered whatever other territory it has been pleased to occupy—to share from day to day its cares, its thoughts and aspirations, it is necessary that every man should read his paper. Why are the French peasants so bewildered at sea? It is because they never read a newspaper. And why are the inhabitants of the United States, though scattered over a territory fourteen times the area of France, so much more capable of concerted action; so much more alive and modern; so much more interested in new discoveries of all kinds, and capable of selecting and utilizing the best of them? It is because the newspaper penetrates everywhere; and even the lonely dweller on the prairie or in the forest is not intellectually isolated from the great currents of public life, which flow through the telegraph and press."

"Mr. Blifkins, I do wish you would give up that abominable practice of punning," said the good lady to the old man at breakfast this morning. "You don't like punning, my dear?" said old B., with affected surprise. "You know very well that I don't. I'd rather have a hedgehog in the house than a punster." "I see," said the incorrigible brute "Hedgehog, eh? H'm—hog. Ah, yes—it's for pork-you-pine," and he slipped under his end of the table, but not in time to dodge the missile. The doctor said he was a pitiable spectacle.

NEW PATENTS—ELECTRICAL—1883.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING AUGUST 7, 1883.

282,833 Conduit for electric conductors; Lemuel Bannister, Philadelphia, Pa.

282,489 Telegraph pole; Thomas Green, Knowlton, Pa.

282,699 Telephone central office apparatus; Wm. M. Brock, assignor one-half to W. H. Douty, Shamokin, Pa.

282 861 Incandescent electric lamp; Paul R. de F. D'Humy, Carlton Mansions, Clapham Rise, county of Surrey, England.

282,867 Telephonic circuit; Wm. H. Eckert and J. A. Seeley, N. Y. City.

282,884 Manufacturing of incandescent electric lamps; John H. Guest, Brooklyn, N. Y.

282,890 Electric gas burner; Chas. H. Huids, N.Y. City.

282,521 Fixture or bracket for electric lamps; Chas. W. Hollzer, Brookline, Mass.

282,534 Incandescent electric lamp; Edward R. Knowles, Brooklyn, N.Y., and F. E. Idell, Hoboken, N. J.

282,914 Compound for electric wire insulators; John F. Martin, Chicago, Ill.

283,921 Electric circuit breaker; Samuel M. Plush, assignor of one-half to H. Bentley, Philadelphia, Pa.

282,791 Unison mechanism for electrical indicators; Frank H. Snell, Washington, D. C.

882,816 Electric gas-lighting and extinguishing device: Le Roy S. White, Waterbury, Conn.

FOR WEEK ENDING AUGUST 14.

283,186—Foree Bain, assignor to Fisher Electric Company, Electric Lamp, Union City, Ind.

283,062—Francis Blake, Jr., Speaking Telephone, Weston, Mass.

282,964—Jas. L. Delaplaine, J. G. Hendrickson and F. J. Clamer, Philadelphia, Pa., removing Tin-scraps from Electricity.

282,969—Charles Egan, Lanesville, O., assignor of two-thirds to D. S. Robeson, New York, N. Y., and E. A. Leslie, Washington, D. C., Telephone.

283,334—Leroy B. Firman, assignor to Western Electric Company, Chicago, Ill., Central-office Apparatus for Telephones.

283 231—Oscar Gassett, Boston, Mass., Electric Locking Mechanism for Switch and Signal Levers.

283,232—Oscar Gassett, Boston, Mass., Railway Signal Locking Apparatus.

283,343—Edwin J. Houston, Philadelphia, Pa., assignor to Thomson-Houston Electric Company, New Britain, Conn., Dynamo-electric Machine.

283,128—William C. Lockwood, Brooklyn, N. Y., assignor to C. J. Dorrance, New York, N. Y., Telephone Transmitter.

283,270—Samuel D. Mott, Menlo Park, N. J., assignor to Edison Electric Light Company, New York, N. Y., Incandescing Electric Lamp.

283,354—Wm. Nichols, Boston, Mass., Telephone Local Call Instrument.

283,355—Chas. P. Orne, Cambridge, Mass., assignor by mesne-assignment to himself and J. S. Orne, Cambridgeport, Mass., Electric Battery.

283,019—Hy. W. Pope, Elizabeth, N. J., Ground Wire Clamp for Telegraph Lines.

283,140—Hy. W. Pope, Elizabeth, N. J., Ground Wire Clamp.

283,152—Charles A. Scott, Boston, Mass., Electric Circuit Track Instrument.

283,155—Robert J. Sheeby, New York, N. Y., Regulator for Dynamo-electric Machines.

283,042—Wm. M. Thomas, assignor of one half to S. W. Skinner, Cincinnati, O., Electric Arc Lamp.

283,168—Elihu Thomson, New Britain, Conn., assignor to Thomson-Houston Electric Company, Boston, Mass., Electric Lamp.

283,167—Elihu Thomson, New Britain, Conn., assignor to Thomson-Houston Electric Light Company, Boston, Mass., Electric Commutator or Switch.

283,308—Jacob P. Tirrell, Somerville, assignor to W. R. Nutting, Boston, Mass., Automatic Circuit-opener.

283,044—Donlee B. Turner, Chicago, Ill., Composition to Insulate, Preserve and Protect Wire for Electrical Purposes.

283,312—Charles H. Wilson, assignor to Western Electric Company, Chicago, Ill., Spring-jack and Circuit for through Telephone Lines.

Asking a Reduction of Royalty on Barb Wires.

Ohio Barb-Wire Fence Company, of Cleveland, O., filed a bill in the Superior Court yesterday, in which they ask for a reduction of the royalty they are paying Washburn & Moen, the owners of the barb-wire patents. They allege they are now paying Washburn & Moen a royalty of ¾ of a cent a pound, which in two years has amounted to $80,000, bur that a manufacturer named Jacob Hirsh is using the same patents without paying any royalty at all, and the Ohio company wants the same chance.

Those mysterious persons who persist in cutting telegraph wires should consider that they are breaking the news too suddenly.

Manufacturing News.

The Neponset mill, at Canton Junction, has been sold to James L. Little & Co., of Boston, for $35,000.

The Palmer Wire Goods Company has organized with $30,000 capital. A two-story brick mill is to be built, and wire cloth only will be manufactured.

There are many instances where observing workmen have called attention to valuable processes. A signal one was in the early period of the cotton manufacture, when a good deal of trouble was caused by the cotton sticking to the bobbins. All the workmen in the mill were delayed by the necessity of stopping work to clean the bobbins. At last one workman found a way to obviate the trouble. He, and he alone in all the mill, had clean bobbins. For a long time he kept his secret to himself. He finally revealed it, on the promise of a pint of beer a day for life. His secret was to "chalk the bobbins." The little scraping of chalk on the bobbins saved millions of dollars a year, and the observing workman got not only his beer but a competence.

The office of the dispatcher of trains of the Maryland division of the Pennsylvania Railroad has been removed from Philadelphia to Wilmington, and all orders for the Philadelphia, Wilmington and Baltimore, and the Baltimore and Potomac Railroads are now taken at Wilmington.

The International Electrical Exhibition was opened on the 16th inst., at Vienna. No specialty exposition among the many of the present year is intrinsically more important. The part which electricity is to play in the comfort and progress of the human race is only beginning its development; but it is obvious that this is the coming motor, as it already is the wondrous messenger of mankind. A collection of the various appliances used to entrap and employ this potent and often elusive agent must be interesting and suggestive.

Dr. Ward, electrician in charge of the Edison electric light for Mexico, has just returned from the Mexican capital. The Doctor reports that great interest is being taken by the Mexicans in electric light and telephone interests.

An incident of the strike: "Thunder and lightning! What's this? Brown & Co. telegraph for one hundred dozen elephants. Must be going into the show business." "That's all right," said the junior partner. "They want a hundred dozen 'Elegantes,' the new brand, you know."—*Hartford Post.*

The Amoy Shanghai cable has been repaired.

The Louisville *Courier Journal* of Aug. 9th, speaks of the electric railway as follows: "Last night the electric railway was in operation, and the locomotive with two cars attached made the tour of the Park. To-day it will be running constantly, and visitors will see what is the latest achievement of science. It is an event of extraordinary interest. It is the practical demonstration of the power of electricity applied as a motor. Without fire or smoke, with no visible agent to propel it, moved by an unseen and even as yet an almost unknown influence, it follows the path market out with all the celerity and certainty demanded by the most cautious and practical; and when one sees how it realizes the dreams and visions of the past, his imagination strives in vain to bound its achievements in the future.

Jay Gould is the biggest railroad operator in the country, but he paid no attention to the order of the Brotherhood to strike.

We are under obligations to Fred. W. Brown & Co., bankers and brokers in telephone stocks, No. 20 Congress street, Boston, Mass., for favors received this week.

Professor Paige says that "in four thousand years another glacial epoch will destroy the world." With this chilling fact staring us in the face, we should not grumble at a few hot days. It will be a cold day four thousand years hence when we get left. Now is the time to subscribe for the REVIEW. It will contain full particulars of the catastrophe up to the hour of going to press.

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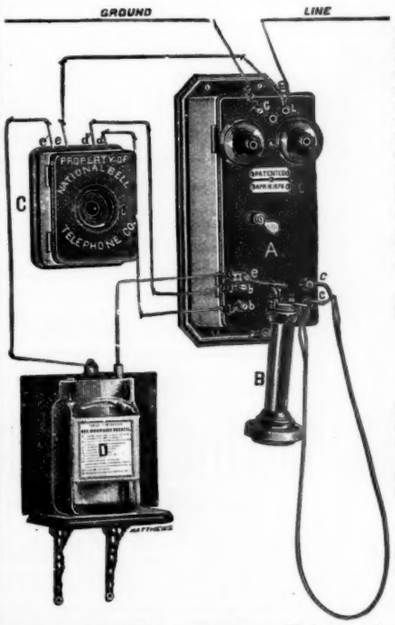

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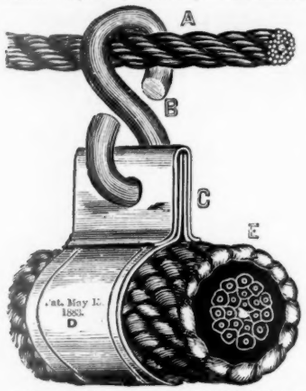

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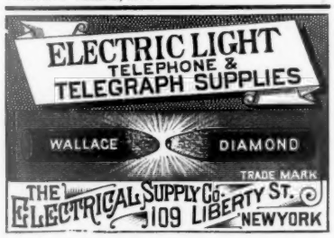

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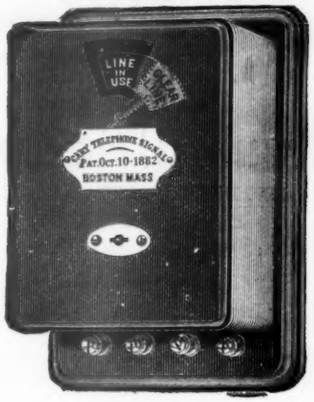

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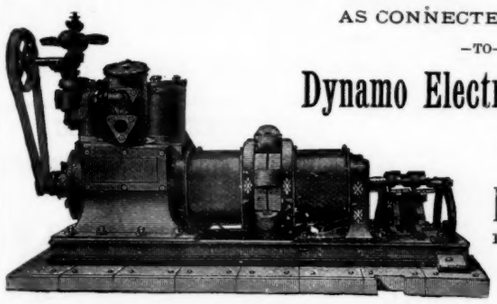

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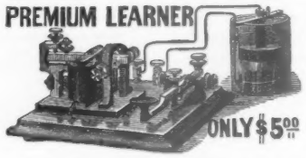

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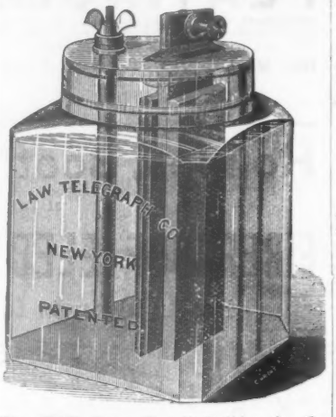

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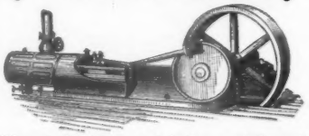

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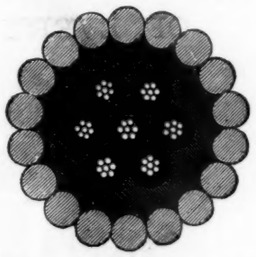

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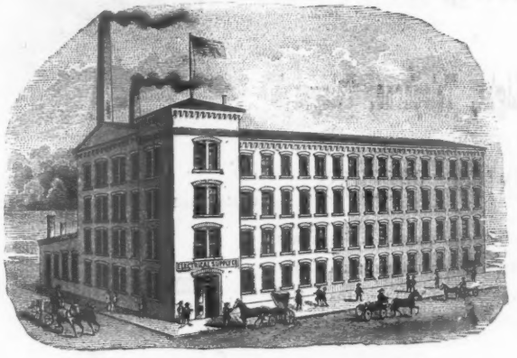

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